

سلسلة كتب الأستاذ

SCIENCE

Main Book

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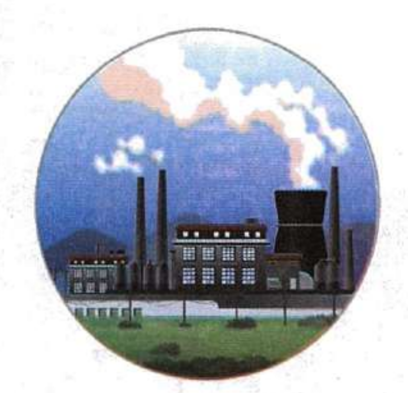


Second Term

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Unit 3 Energy and Fuel

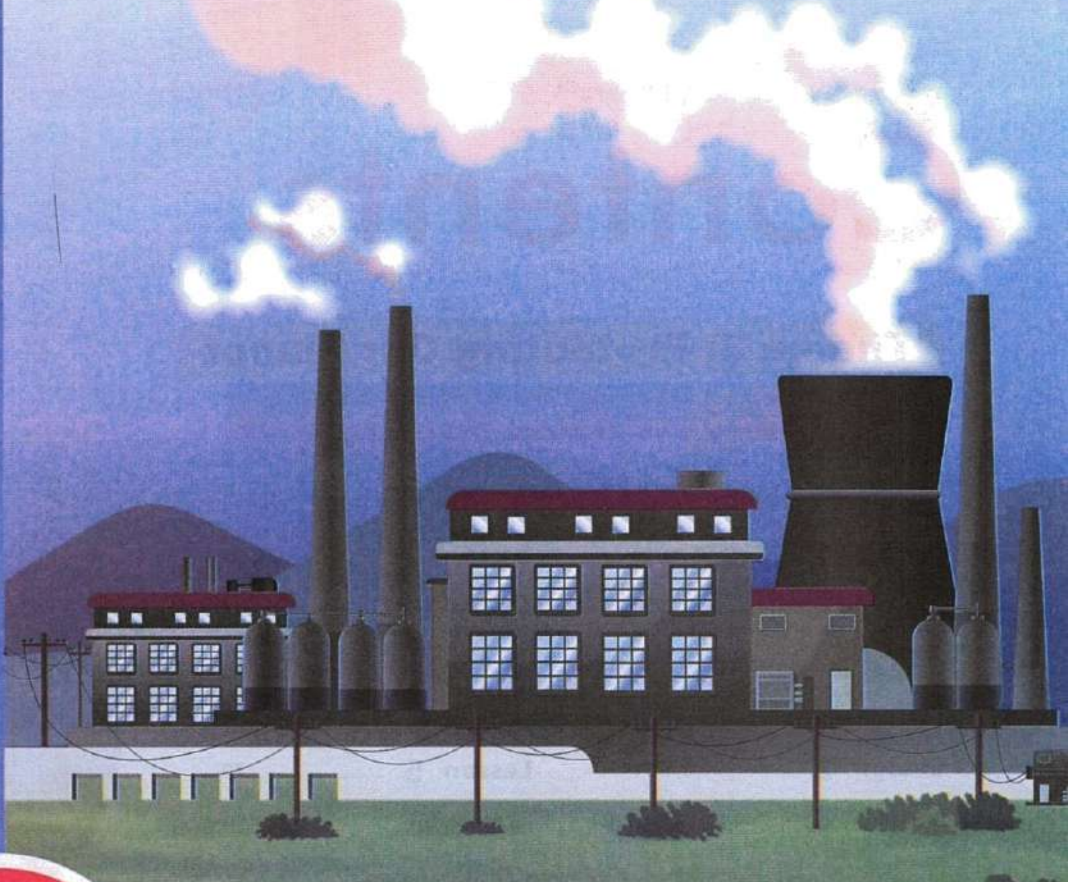


Theme 4: Change and Stability

Unit 4 Shifting Surfaces









Energy and Fuel

Unit Concepts:

Concept 1 Devices and Energy

Concept 2 About Fuel

Concept 3 Renewable Energy Resources

Unit Project: Dam Impacts

Unit Objectives

In this unit, we will study:

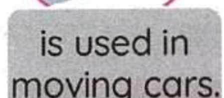
1. Energy and devices around us.
2. Types of fuel.
3. Renewable and nonrenewable sources.
4. How electricity is being generated in electric power station.
5. Using wind energy to generate electricity.
6. Using water of river to generate electricity.
7. How can we conserve energy?

Get Started
What I Already Know

» Humans use many forms of fuel in their daily lives, such as:

Gasoline





is used in moving cars.

Natural gas



is used in cooking.

Wood



is used in warming.

Fuel is burned in electric power stations to generate electricity that is used in lighting houses and operating devices.



Water for Energy

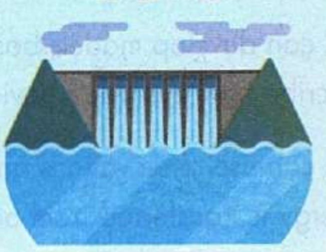
» The moving water has kinetic energy, that can be used to produce energy.

Watermills



- In the past, people have used moving water to turn the wheels of watermills to create energy to move machines.

Dams



- In modern time, dams are used to increase the kinetic energy of water.
- Fast-moving water is used to turn large turbines to generate electricity.



Concept 1

Devices and Energy

Concept Objectives:

By the end of this concept:

- Students can develop models based on observations that describe how everyday devices transform energy.
- Students can use observations and evidence to explain how energy is transferred from one place to another.

Key Vocabulary:

- Chemical energy
- Energy transfer
- Energy conservation
- Energy source
- Sun
- Earth

Concept 1

Devices and Energy

Lesson 1	
Activity 1	Can You Explain?
Activity 2	Energy in Remote-Controlled Cars
Activity 3	Mars Rover

Lesson 2	
Activity 4	What Do You Already Know About Devices and Energy?
Activity 5	Energy Chains

Lesson 3	
Activity 6	Energy and Everyday Devices
Activity 7	The Conversation of Energy

Lesson 4	
Activity 8	Follow the Flow
Activity 9	Build an Energy Chain
Activity 10	Record Evidence Like a Scientist Energy in Remote-Controlled Cars

Lesson 1



Activity 1 Can You Explain?

» We have learned that,

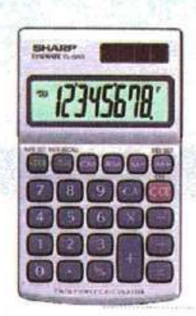
- Energy can be changed from one form to another.
- Most devices in our houses need electricity.

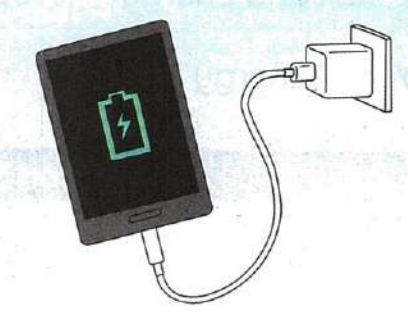


Technology can help us turn light energy from the Sun into different forms of energy.

- تساعدنا التكنولوجيا على تحويل الطاقة الضوئية من الشمس إلى صُوَر مختلفة من الطاقة.

- Solar cells can convert solar energy into electrical energy to operate many devices, such as calculators and mobile phones.





- تقوم الخلايا الشمسية بتحويل الطاقة الشمسية إلى طاقة كهربية؛ لتشغيل العديد من الأجهزة مثل: الآلات الحاسبة والتليفونات المحمولة.

Check your understanding?

» Put (✓) or (✗):

1. Most of the energy we use every day comes from the Sun. ( )
2. Solar energy is a clean source of energy. ( )
3. Solar-powered calculators use electricity. ( )



Activity 2 Energy in Remote-Controlled Cars

Choose the correct answer:

1. Toy cars are controlled .... from a distance. (manually - remotely)
2. Batteries are used to operate .... (electric devices - some toys)

Many toys may be operated remotely, such as:

1. Cars
2. Trucks
3. Planes
4. Boats



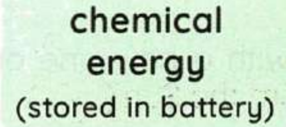
All of these toys need **energy** and use **electricity** to move and do tasks, such as turning corners, moving their arms, or operating cameras.

- تعمل العديد من الألعاب بالتحكُّم عن بُعْد مثل: السيارات والشاحنات والطائرات والمراكب.
- كل هذه الألعاب تحتاج إلى طاقة وتَستخدم الكهرباء للتحرُّك والقيام بمهام مثل: الانعطاف وتحريك الأذرع أو تشغيل الكاميرات.

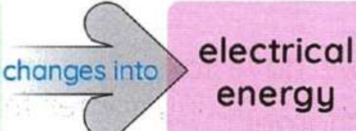
How do these toys get energy



- Toys need a source of energy to operate, such as **batteries**.
- Batteries store **chemical energy** inside them.
- When toys are operated;



chemical energy (stored in battery)



changes into → electrical energy



changes into → kinetic energy and sound energy

- تحتاج الألعاب إلى مصدر للطاقة مثل البطاريات لتعمل.
- تخزن البطاريات طاقة كيميائية بداخلها.
- عندما يتم تشغيل اللعبة، تتحوَّل الطاقة الكيميائية إلى طاقة كهربائية، والتي يتم تحويلها إلى طاقة حركية أو صوتية.

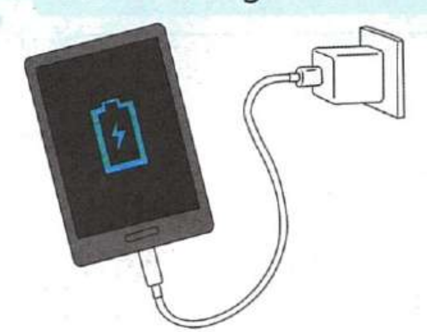
What can we do when the batteries of toys run out



Batteries can be



- By plugging the device into the nearest charger.



2 Replaced

- With new ones from a store.



• عند نفاد شحن البطاريات يمكننا:

1 شحنها عن طريق توصيلها بأقرب مَقْبِس.

2 استبدالها عن طريق شراء بطاريات جديدة من أحد المتاجر.

Check your understanding?

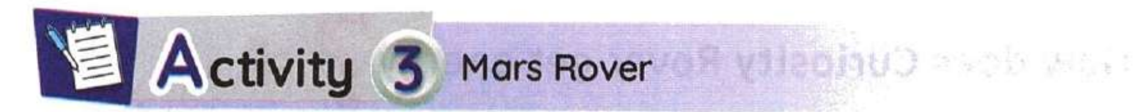
Fill these gaps with the correct words:

(electrical - kinetic - sound - chemical - replace - recharge - Energy)

1. .... can be changed from one form to another.
2. When a toy car is operated, ... energy inside the battery changes into .... energy, then into .... energy or .... energy.
3. If the battery runs out, we have to .... it with a new one or .... it into a nearby charger.



Discuss with your students the importance of batteries in operating some devices.

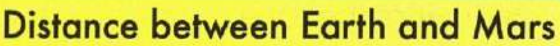


Activity 3 Mars Rover

Concept 1

- The distance between Earth and Mars is about **54 million kilometers**.
- A spacecraft takes **six months or more** to reach Mars.
- In the past few years, humans have sent many missions to Mars using robots and vehicles operated **remotely** and none of these missions included people.





Distance between Earth and Mars



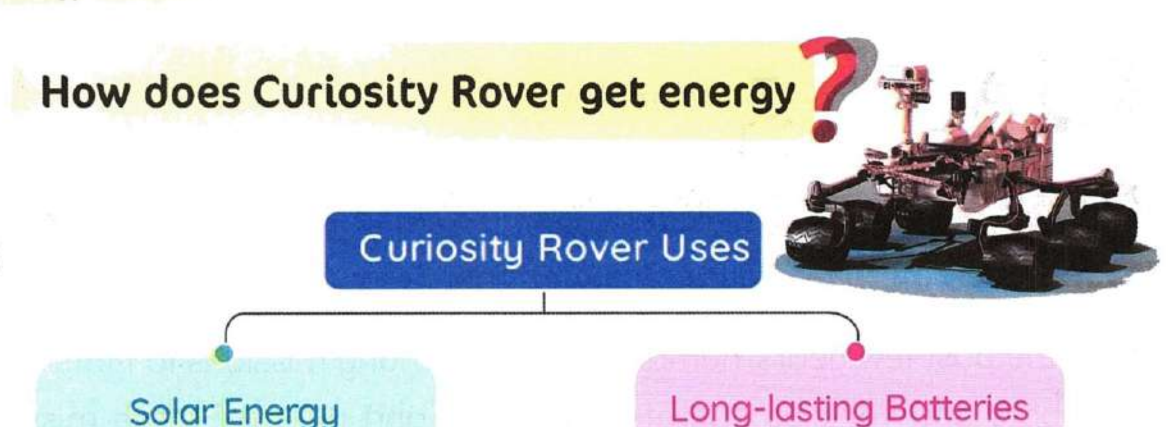
Curiosity Rover

- One of the most famous robots on Mars is the **Curiosity Rover**.
- Like remote-controlled toys, these rovers need **energy**.



The batteries used in the toys cannot be used in these robots.
Because robots on Mars are too far from local stores or sockets (plugs) on Earth.

- المسافة بين الأرض والمريخ تبلغ حوالي ٥٤ مليون كيلومتر.
- تستغرق المركبة الفضائية حوالي ستة أشهر أو أكثر لتصل إلى كوكب المريخ.
- في الماضي، أرسل البشر العديد من البعثات إلى المريخ بواسطة الروبوتات والمركبات التي يتم تشغيلها عن بُعْد، ولم تضم تلك البعثات أشخاصًا.
- من أشهر تلك الروبوتات Curiosity Rover.
- كالألعاب التي تعمل بالتحكم عن بُعْد، تحتاج تلك الروبوتات إلى مصدر للطاقة.



How does Curiosity Rover get energy?

Curiosity Rover Uses

- Solar Energy
- Long-lasting Batteries



Enrichment information:

How does the Curiosity Rover move and explore Mars?



- Solar panels on the rover convert solar energy into electrical energy to charge the rover's batteries.
- Electrical energy from the batteries powers the rover's sensors, and electrical energy is converted into thermal and kinetic energies as the rover moves and explores Mars.

• تعمل الألواح الشمسية الموجودة في العربة على تحويل الطاقة الشمسية إلى طاقة كهربائية تُستخدم لشحن بطاريات العربة.

• تقوم الطاقة الكهربائية في البطارية بتشغيل المستشعرات، وتتحوَّل الطاقة الكهربية إلى طاقة حرارية وحركية تُمكِّن العربة من الحركة واكتشاف المريخ.

Check your understanding?

Put (✓) or (✗):

1. Operating remotely means being controlled from a distance. (   )
2. It is easy to replace the batteries of the Curiosity Rover. (   )
3. Some of the exploration missions to Mars contain humans. (   )
4. Curiosity Rover is used to explore the moon. (   )

Exercises on Lesson 1

1 Choose the correct answer:

1. Energy can be .... from one form to another.
   a. changed b. destroyed c. created d. b and c
2. Most toys depend on .... as a source of energy.
   a. water b. batteries c. fuel d. food
3. .... toys can be operated remotely from a distance.
   a. Car b. Plane c. Boat d. All the previous
4. Batteries store .... energy inside them.
   a. chemical b. electrical c. solar d. kinetic
5. Batteries can be .... by electricity.
   a. changed b. charged c. replaced d. converted
6. In a battery of a toy car, ... energy is changed into electrical energy.
   a. thermal b. chemical c. sound d. light
7. Curiosity Rover is designed to explore ....
   a. the Sun b. the moon c. Mars d. Earth
8. The distance between Earth and Mars is about .... million km.
   a. 45 b. 55 c. 54 d. 540
9. We can convert the solar energy into .... energy inside the solar panels.
   a. kinetic b. thermal c. electrical d. sound
10. Which of the following is considered energy?
    a. Air b. Fuel c. Water d. Electricity
11. Both toy cars and Curiosity Rover ....
    a. use solar energy b. explore Mars
    c. are controlled remotely d. use the same batteries

2 Put (✓) or (✗):

1. Energy can't be transformed from one form to another. ( )
2. Technology helps us turn light energy from the Sun into different forms. ( )

3. When a toy is operated, chemical energy is produced. ( )
4. If the battery of your mobile runs out, you must replace it. ( )
5. Mars Rover and toy cars can be operated from a distance. ( )
6. Mars is located a few kilometers away from Earth. ( )
7. All missions sent to explore Mars in the last decade included people. ( )
8. It takes several days for a spacecraft to reach Mars. ( )

3 Write the scientific term:

1. A robotic vehicle that is used to explore the surface of Mars. (..........)
2. The form of energy that is stored in the battery. (..........)
3. A tool on Mars rover that enables it to get energy. (..........)
4. The source of energy used to operate Curiosity Rover. (..........)

4 Complete the following using the words between the brackets:

(sound - sensors - electrical - replace - recharge - chemical - kinetic)

1. A battery stores .... energy inside it, while it produces .... energy.
2. To keep playing with your toy car, you must .... it with a new one.
3. Electrical energy from the batteries powers the Mars Rover's ....
4. When a toy car is operated, electrical energy is changed into .... energy or .... energy.

5 Choose from column (A) what suits it in column (B):

A

Column (A)	Column (B)
1 Curiosity Rover	a. can't be changed from one form to another.
2 Remotely-controlled toy cars	b. can be converted into another form.
3 Energy	c. depends on solar panels to get needed energy.
	d. depend on small batteries to get their energy.

1 .... 2 .... 3 ....

B

Column (A)	Column (B)
1 Solar energy	a. it is the source of energy for Curiosity Rover.
2 Chemical energy	b. it is produced when the toy car is operated.
3 Kinetic energy	c. it is stored inside a battery.

1 .... 2 .... 3 ....

6 Study the following figures, then complete the following questions:

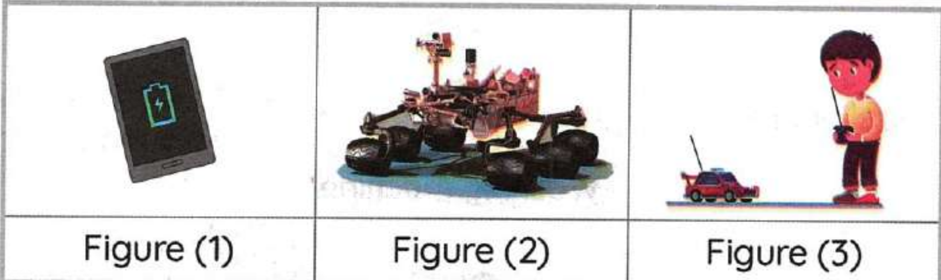


Figure (1) Figure (2) Figure (3)

1. The batteries of figure (........) are too far from any plugs or stores.
2. The batteries of figure (........) can be recharged from wall socket.
3. The batteries of figure (........) can be replaced by new batteries.
4. Figures (........) and (........) can be controlled from a distance.

7 Give reasons for:

1. Toy cars need a source of energy.

   ....

2. Mars Curiosity Rover needs a source of energy.

   ....

3. The batteries used to operate toys can't be used in operating the Mars Rover.

   ....

8 What happens if?

1. The battery of a drone is exhausted?

   ....

2. Mars Rover's batteries were not recharged?

   ....

Lesson 2



Activity 4 What Do You Already Know About Devices and Energy?



Let's think about how different devices get energy and how the energy changes.

Consumed Energy (Input Energy)	Device	Produced Energy (Output Energy)
Electrical energy	Washing machine	• Kinetic energy • Sound energy
Electrical energy	Hair dryer	• Thermal energy • Sound energy • Kinetic energy
Potential energy (stored in the spring of the soap dispenser)	Soap dispenser	Kinetic energy (movement of the soap)

Input energy: it is the energy consumed in the device.

Output energy: it is the energy produced from the device.

Check your understanding?

Put (✓) or (✗):

1. Sound energy is consumed in radio. ( )
2. Electrical energy is the output energy of solar panels. ( )

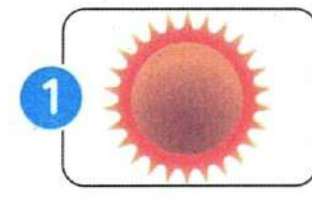


Activity 5 Energy Chains

- The Sun is considered the **main source** of energy for all devices we use.
- **Energy chains** show the path of energy from the Sun to different devices.

- تُعتبر الشمس هي المصدر الرئيسي للطاقة لجميع الأجهزة التي نستخدمها.
- تساعدنا سلاسل الطاقة على معرفة مسار الطاقة من الشمس وصولًا للأجهزة المختلفة.

1 Energy chain when eating food, such as an orange

1 

- The Sun produces energy that reaches the Earth in the form of light and heat.

↓

2 

- The green plant converts the **light energy** of the Sun into **chemical energy** stored in the form of sugars inside the orange tree.

↓

3 

- When you eat an orange, your body stores **chemical energy** and converts it into **kinetic energy** when you move.

1. تُصدر الشمس طاقة تصل إلى الأرض في صورة ضوء وحرارة.
2. يُحوِّل النبات الطاقة الضوئية من الشمس إلى طاقة كيميائية مختزنة في صورة مواد سكرية.
3. عند تناول البرتقالة يقوم جسمك بتخزين الطاقة الكيميائية ويُحوِّلها لطاقة حركية عندما نتحرك.

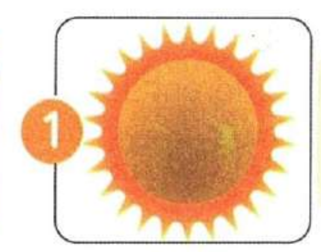
Light energy (from the Sun) → is converted into → **chemical energy** (stored inside the plant then inside your body) → is converted into → **kinetic energy** (to do different activities)



During running, there is a change of energy inside your body.
Because the chemical energy stored in the food is converted into kinetic energy that helps your body move.



2 Energy chain when heating a pot of water over a fire

1 

Light energy that comes from the Sun causes the growth of trees.



2 

This plant converts the light energy of the Sun into chemical energy, which is stored inside the tree in the form of sugars.

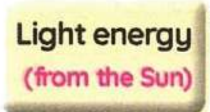


3 

When the wood of the trees is burned, thermal energy is released, which heats the water inside the pot.

1 تعمل الطاقة الضوئية الصادرة من الشمس على نمو الأشجار.
2 يُحوِّل النبات الطاقة الضوئية من الشمس إلى طاقة كيميائية مختزنة في صورة مواد سكرية.
3 عند حرق قِطَع من أخشاب الأشجار تُنْتَج طاقة حرارية تُستخدم لتسخين الماء في الإناء.

Light energy (from the Sun) → is converted into → **chemical energy** (stored inside the tree) → is converted into → **thermal energy** (when burning the wood of trees to heat water inside the pot)





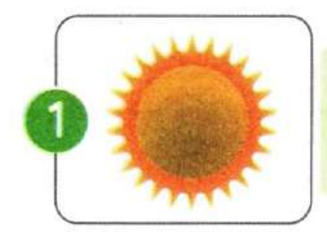
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There is a change in energy when burning wood.

Because the chemical energy stored inside the wood of trees is converted into thermal energy.



3 Energy chain in a hair dryer



1

- Light energy that comes from the Sun causes the growth of trees.



2

- Coal is produced from the remains of dead trees that died millions of years ago.
- Coal is a source of energy that stores chemical energy



3

In the electric power station:

- Coal is burned to produce thermal energy
- Thermal energy is converted into kinetic energy
- A certain device changes kinetic energy into electrical energy



4

- The electrical energy reaches the hair dryer through an electric cord (wire) made of copper.



5

- When the hair dryer is operated, electrical energy changes into:
  - Thermal energy.
  - Kinetic energy.
  - Sound energy.

1 تعمل الطاقة الضوئية الصادرة من الشمس على نمو الأشجار.

2 يتكوَّن الفحم من بقايا الأشجار الميتة من ملايين السنين. يُعتبر الفحم من مصادر الطاقة التي تختزن بداخلها الطاقة الكيميائية.

3 في محطة توليد الكهرباء:

يتم حرق الفحم وتتولد طاقة حرارية.

تتحوَّل الطاقة الحرارية لطاقة حركية.

يقوم جهاز معين بتحويل الطاقة الحركية إلى طاقة كهربية.

4 تصل الطاقة الكهربية إلى مجفف الشعر عبر أسلاك تُصنع من النُّحاس.

5 عند تشغيل مجفف الشعر تتحوَّل الطاقة الكهربية إلى طاقة حرارية، كما تتولَّد طاقة صوتية وطاقة حرارية.

Unit 3

The following diagram shows the energy path from the Sun to the hair dryer.

Light energy (from the Sun) → is converted into → **chemical energy** (stored inside coal) → is converted into → **thermal energy** (when burning the coal inside a power plant) → is converted into → **electrical energy** (goes through the electric wires) → is converted into → • **Thermal energy** • **Sound energy** • **Kinetic energy** (in the hair dryer)



Energy Chain: It is a way to describe the energy flow that occurs when we use different devices.

سلاسل الطاقة:هي طريقة تُوضّح كيفية انتقال الطاقة عند استخدام الأجهزة المختلفة.

NOTES:

- Not all the energy in the energy chain reaches the device.
- At each link in the energy chain, some of the energy escapes as other forms that the device does not use.
- Most of the lost energy leaks out in the form of heat.

•لا تصل كل الطاقة التي دخلت سلسلة الطاقة إلى الجهاز كما نريد.

•في كل حلقة في سلسلة الطاقة، تتسرَّب بعض الطاقة في هيئة صُوَر أُخرى لا يستخدمها الجهاز.

•معظم الطاقة المفقودة تتسرَّب على شكل حرارة.

Check your understanding?

Put (✓) or (✗):

1. Green plants store chemical energy in the form of sugar. ( )
2. Coal is used in electric power stations to generate electricity. ( )
3. Electrical energy can flow through wires made of wood. ( )

Exercises on Lesson 2

1 Choose the correct answer:

1. The input energy is the energy .... devices.
   a.destroyed in b.consumed by c.produced from d.resulted from
2. .... is considered the main source of energy on the Earth's surface.
   a.Fuel b.The moon c.The Sun d.A battery
3. We can use .... to produce thermal energy in power stations.
   a.the moon b.glass c.the Sun d.coal
4. Some energy is lost in most devices in the form of .... energy.
   a.electrical b.thermal c.sound d.kinetic
5. Electric wires are made up of .... material.
   a.plastic b.wood c.iron d.copper
6. The input energy in Curiosity Rover is .... energy.
   a.thermal b.solar c.electrical d.kinetic
7. Which form of energy is not used or produced in a hair dryer?
   a.Sound energy b.Thermal energy
   c.Light energy d.Electrical energy
8. .... energy is consumed while burning wood.
   a.Thermal b.Chemical c.Kinetic d.Light
9. All of these energies are produced from the hairdryer, except the .... energy.
   a.sound b.thermal c.kinetic d.electrical
10. All of the following store chemical energy, except ....
    a.a battery b.an apple
    c.a compressed spring d.coal

2 Put (✓) or (✗):

1. Most energy chains start with the moon. ( )
2. The energy chain of a burning candle is composed of chemical energy converted into thermal energy and light energy. ( )

3. There is stored chemical energy inside the food we eat. ( )
4. Energy can't be transformed from one form to another. ( )
5. Coal is produced from the remains of dead trees that died millions of years ago. ( )
6. Plants need sunlight to grow. ( )
7. We can use the energy of the Sun to produce electricity. ( )
8. All the energy that enters the energy chain reaches the device completely. ( )
9. On pressing the spring of the soap dispenser, the soap moves upward. ( )

3 Write the scientific term:

1. The main source of energy for most forms of energies on Earth. (..................)
2. The energy produced when the wood of trees is burned. (..................)
3. The form of energy that is stored in the battery of a remote control. (..................)
4. The energy stored in plants in the form of sugar. (..................)
5. A part of the soap dispenser that stores potential energy that is changed into kinetic energy. (..................)
6. A path that shows the energy flow from its source to the device. (..................)

4 Complete the following sentences:

1. In any energy chain, some of the energy is lost in the form of ....
2. The energies that are produced from the washing machine are .... energy and .... energy.
3. .... can be used in electric power stations to generate electricity.
4. During running, ... energy stored in the human body is changed into .... energy.

5 Choose from column (A) what suits it in column (B):

Column (A)	Column (B)
1 Chemical energy	a. it is the energy produced during running.
2 Sound energy	b. it is the input energy in a soap dispenser.
3 Kinetic energy	c. it is the produced energy from the radio.
4 Potential energy	d. it is stored inside a tree.

1 .... 2 .... 3 .... 4 ....

6 Arrange the following steps according to:

Energy chain in a hair dryer:

a ( ) Electricity is transferred through huge wires to cities.

b ( ) Trees absorb light energy and store it as chemical energy.

c ( ) The Sun emits light energy that reaches the Earth.

d ( ) Heat, sound, and kinetic energies are produced.

e ( ) Coal is burned in the electric power station.

f ( ) Electricity passes through wires to the hair dryer.

7 Study the following figures, then complete the following questions:

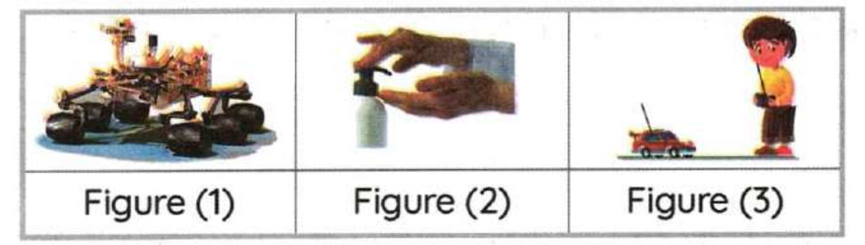


Figure (1)	Figure (2)	Figure (3)

1. .... energy is the output energy in all these figures.
2. Figure (..........) depends on solar energy to be operated.
3. Figures (..........) and (..........) can be controlled from a distance.
4. The input energy of figure (..........) is the chemical energy stored in the battery.
5. The input energy of figure (..........) is potential energy.

8 Complete the following energy chain:

.... energy (from the Sun) → converted into → .... energy (stored inside the plant) → converted into →

The .... energy stored in food changes to .... energy, allowing us to move and do all activities.

9 Give reasons for:

1. The Sun is considered the main source of energy for all devices.

....

....

2. Not all the energy that enters the energy chain reaches the device.

....

....

3. There is a change in energy when burning wood of trees.

....

....

4. During running, there is a change of energy happens in your body.

....

....

Lesson 3

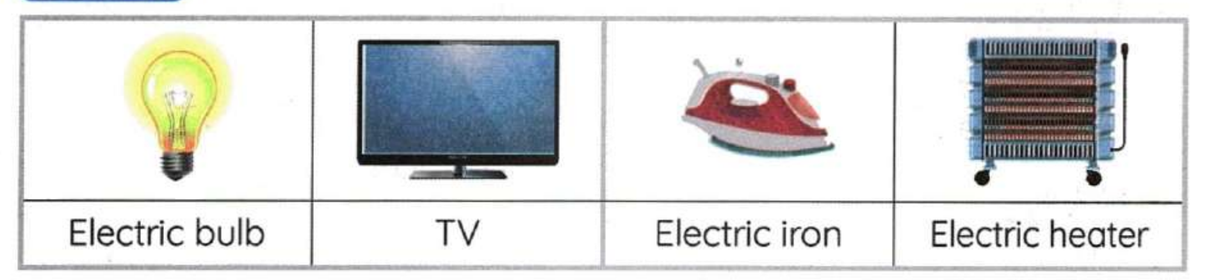
 Activity  6 Energy and Everyday Devices

Experiment 

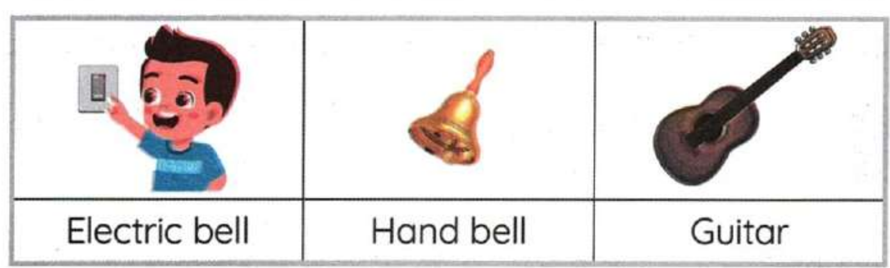
» In this activity, you will use what you know about types of energy to describe the input and output energies of different devices.

• في هذا النشاط، سوف تَستخدم ما تعرفه عن أنواع الطاقة لوصف مدخلات ومخرجات الطاقة للأجهزة المختلفة.

Tools:



Electric bulb	TV	Electric iron	Electric heater



Electric bell	Hand bell	Guitar

Toy car (it is operated by spring)	Toy car (it is operated by battery)	Watch

Steps:

1. Analyze each device.
2. Determine the input energy and output energy for each device.
3. Record your observations in the following table:

Results:

Device	Function	Input Energy Incoming/Used/ Consumed Energy	Output Energy Outcoming/ Resulted Energy
1 Electric bulb	Lighting	Electrical energy	Light energy Thermal energy
2 TV	Display sound and image	Electrical energy	Light energy Sound energy
3 Electric iron	Ironing clothes	Electrical energy	Thermal energy
4 Electric heater	Warming	Electrical energy	Thermal energy
5 Electric bell	Alerting	Electrical energy	Sound energy
6 Hand bell		Kinetic energy	Sound energy
7 Guitar	Playing music	Kinetic energy	Sound energy

Concept

Device	Function	Input Energy Incoming/Used/ Consumed Energy	Output Energy Outcoming/ Resulted Energy
8 Toy car (it is operated by a spring)	Toys for kids	Potential energy (stored in a spring)	Kinetic energy
9 Toy car (it is operated by a battery)		Chemical energy (stored in a battery)	Kinetic energy
10 Watch	Knowing time	Chemical energy (stored in a battery)	Kinetic energy

Conclusion:

- Any device needs a source of energy to operate.
- Energy can be changed from one form to another.
- Some of the input energy escapes in other forms that the devices don't use to perform their functions.

يحتاج كل جهاز إلى مصدر للطاقة لتشغيله.
يمكننا تحويل الطاقة من صورة لأخرى.
تتسرَّب بعض مدخلات الطاقة داخل الأجهزة لصُوَر أخرى قد لا تستخدمها الأجهزة لأداء وظائفها.

Check your understanding?

Put (✓) or (✗):

1. When you rub your hands together, kinetic energy is transformed into thermal energy. (   )
2. During clapping, sound energy is produced. (   )

Check your understanding?



Mention the input and output energies for these devices:

Device	Function	Input Energy Incoming/Used/ Consumed Energy	Output Energy Outcoming/ Resulted Energy
1 Radio		....	....
2 Fan		....	....
3 Blender		....	....
4 Flashlight		....	....
5 Kettle		....	....
6 Drum		....	....
7 Curiosity Rover		....	....



Activity 7 The Conservation of Energy

Concept

» Put (✓) or (✗):

1. Kinetic energy is produced when we let the spring of a toy car. ( )
2. A toy car that is operated by a spring depends on chemical energy. ( )

- In the previous lesson, we learned that energy can be transformed easily from one form to another.
- Now, let's study some examples of energy transformation.

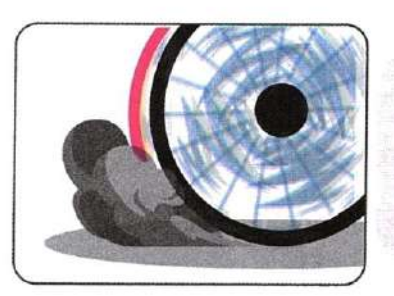
Example 1 Energy chain while riding a bike



- When you eat your breakfast, thechemical energy stored in the food provides your body with energy.



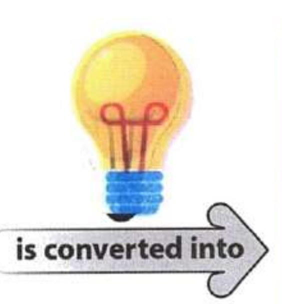
- When you push pedals, chemical energy is converted intokinetic energy , which moves the bike.



- A part of the kinetic energy changes to thermal energy due to the friction between the wheels of the bike and the road.

Example 2 Energy chain in the light bulb

- When you turn on a light bulb, the electrical energy that powers the light bulb.



is converted into

- Light energy, so the room becomes brighter.
- Thermal energy, so you feel the heat when you approach your hand near the light bulb.

From the previous:

- The new energy cannot be created from nothing.
- The old energy does not disappear, but it changes from one form into another.
- This is called " The Law of Conservation of Energy".

- لا يمكن أن تُخْلَق الطاقة الجديدة من العدم (لا شيء).
- الطاقة القديمة لم تختفِ، لكنها تتغيَّر من صورة لأخرى.
- هذا يُسمى «قانون حفظ الطاقة».

Law of Conservation of Energy

Energy is neither created nor destroyed it can only be converted from one form to another.

قانون بقاء الطاقة: الطاقة لا تَفْنَى أو تُستحدث من العدم، ولكن يمكن تحويلها من صورة لأخرى.

Check your understanding?

Put (✓) or (✗):

1. Thermal energy doesn't help the light bulb to do its main job.(   )
2. Our bodies store kinetic energy that allows us to move. (   )

Exercises on Lesson 3

1 Choose the correct answer:

1. The input energy in the fridge is .... energy.
   a. light b. electrical c. sound d. kinetic
2. All the following devices produce thermal energy, except the ....
   a. hair dryer b. watch c. kettle d. electric heater
3. Sound energy is produced from all the following devices, except the ....
   a. washing machine b. hair dryer
   c. mobile phone d. electric iron
4. The .... uses the thermal energy to do its function.
   a. mobile phone b. washing machine
   c. TV d. hair dryer
5. The .... changes electrical energy into light and sound energies.
   a. washing machine b. TV
   c. radio d. hair dryer
6. The produced .... energy doesn't help the blender do its job.
   a. sound b. kinetic c. chemical d. potential
7. In all of these devices, kinetic energy is converted into sound energy, except the ....
   a. guitar b. electric bell c. hand bell d. drum
8. When you turn on your television, the electrical energy travels through .... until it reaches it.
   a. wires b. air c. screens d. plastics
9. During riding a bike, some kinetic energy is converted into .... energy due to the friction of the bike's tire with the road.
   a. chemical b. potential c. thermal d. electrical
10. During playing football, the chemical energy inside the body is converted into .... energy.
    a. light b. kinetic c. potential d. electrical

11 .... is a lost energy in the light bulb, but it isn't in the electric kettle.

a. Light energy
b. Thermal energy
c. Chemical energy
d. Sound energy

2 Put (✓) or (✗):

1. Both the electric bulb and the electric heater produce thermal energy. ( )
2. When you rub your hands, kinetic energy changes to heat energy. ( )
3. The produced sound energy helps the blender do its function. ( )
4. Thermal energy is considered the input energy of electric heaters. ( )
5. Both the TV and mobile phone use batteries. ( )
6. Flashlights change chemical energy into light and thermal energies. ( )
7. There is energy loss when energy is transformed from one form to another. ( )
8. When pedalling a bike, the chemical energy in your body changes to kinetic energy. ( )
9. There is a stored chemical energy inside the food we eat. ( )
10. All the energy that comes from the Sun will reach our home devices. ( )
11. Energy is not necessary for some of our daily activities. ( )
12. Some devices are operated without the need for energy. ( )
13. The human body stores the same kind of energy inside batteries. ( )
14. Kinetic energy changes to sound energy during clapping. ( )

3 Write the scientific term:

1. A device used to convert electrical energy into light energy. (..............................)
2. The energy produced when the wood of trees is burned. (..............................)
3. The energy that is produced from the blender and helps it in doing its job. (..............................)
4. The energy produced from playing the guitar. (..............................)
5. The lost energy on using a computer. (..............................)
6. The energy that is always produced due to friction. (..............................)
7. The energy stored inside all living organisms bodies. (..............................)
8. The incoming energy of the light bulb. (..............................)
9. The output energy that helps the light bulb to do its main job. (..............................)
10. The main source of energy on the Earth. (..............................)
11. The material that electric wires are made from. (..............................)
12. Energy can neither be created nor destroyed, but it's only converted from one form to another. (..............................)
13. The energy produced from the electric lamp and affects your eyes. (..............................)

4 Complete the following sentences:

1. The electric lamp converts .... energy into light and heat energies.
2. In the electric heater, ... energy is considered an input energy, while thermal energy is considered an .... energy.
3. To operate an electric mixer, we use .... energy.
4. Both sewing machine and vacuum cleaner produce .... and .... energies.

5 Complete the following using the words between the brackets:

(input - chemical - sound - kinetic - output - light)

1. The mobile phone converts chemical energy stored in its battery into .... energy and .... energy.
2. When you ride a bicycle, the .... energy stored in your body is converted into .... energy, which makes the bicycle move.
3. The kinetic energy in a hand bell is considered as .... energy, while in a small watch it's considered as .... energy.

6 Cross out the odd word:

1. Food - Battery - Lamp - Coal (....................)
2. TV - Mobile phone - Radio - Computer (....................)
3. Hairdryer - Blender - Washing machine - Light bulb (....................)

7 Choose from column (A) what suits it in column (B):

Column (A)	Column (B)
1 Solar panels	a. converts the electrical energy into sound energy.
2 Electric fan	b. changes the electrical energy into light and thermal energies.
3 Radio	c. changes the electrical energy into kinetic energy.
4 Electric bulb	d. changes the solar energy into electrical energy.



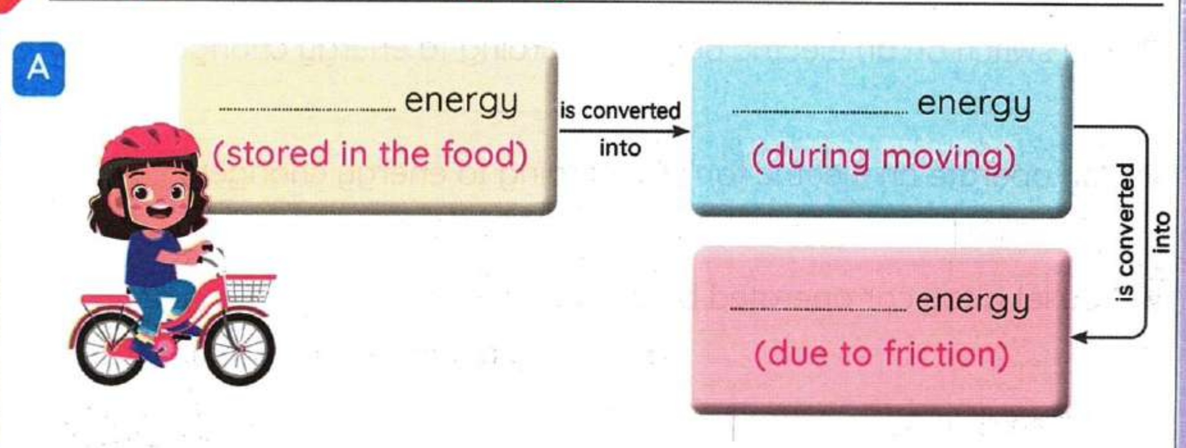
1 .... 2 .... 3 .... 4 ....

8 Complete the following table:

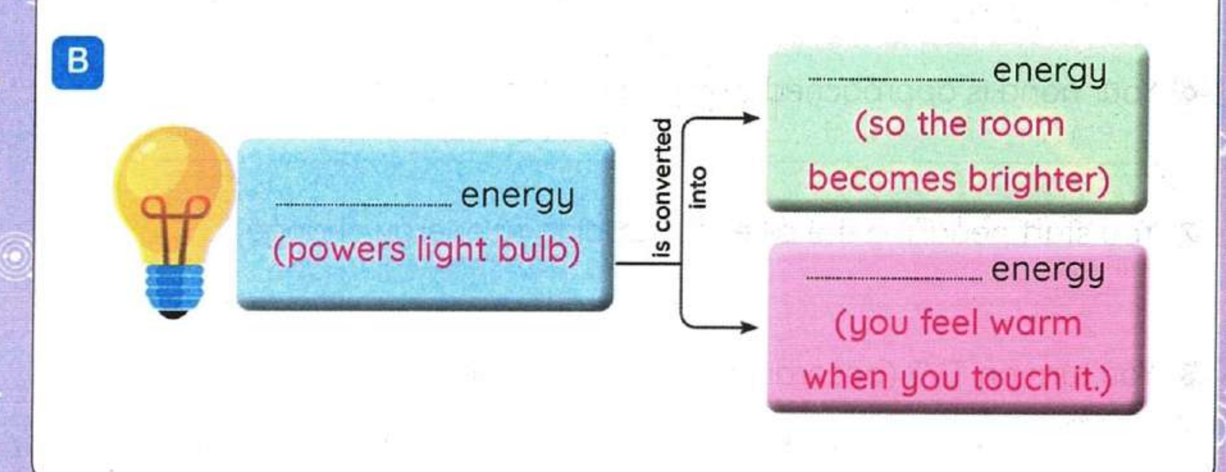
Input Energy	Device	Output Energy
....	1	....
....	2	....
....	3	....

9 Complete the following diagrams:

A



B



10 Give reasons for:

1. You feel warm when you put your hands near a lighted light bulb.

....

2. The computer gets warm when being used for a long time.

....

3. You feel warm when you touch the tire of a bike after you stop moving.

....

11 What happens if?

1. You rub your hands? (according to energy changes)

....

2. You switch on an electric bulb? (according to energy changes)

....

3. You operate an electric fan? (according to energy changes)

....

4. You let a toy car operated by a spring move? (according to energy changes)

....

5. You operate home devices for a long time?

....

6. Your hand is approached to a lighted electric lamp?

....

7. You start pedalling the bike? (according to energy change)

....

8. You turn on TV? (according to energy change)

....



Lesson 4



Activity 8 Follow the Flow

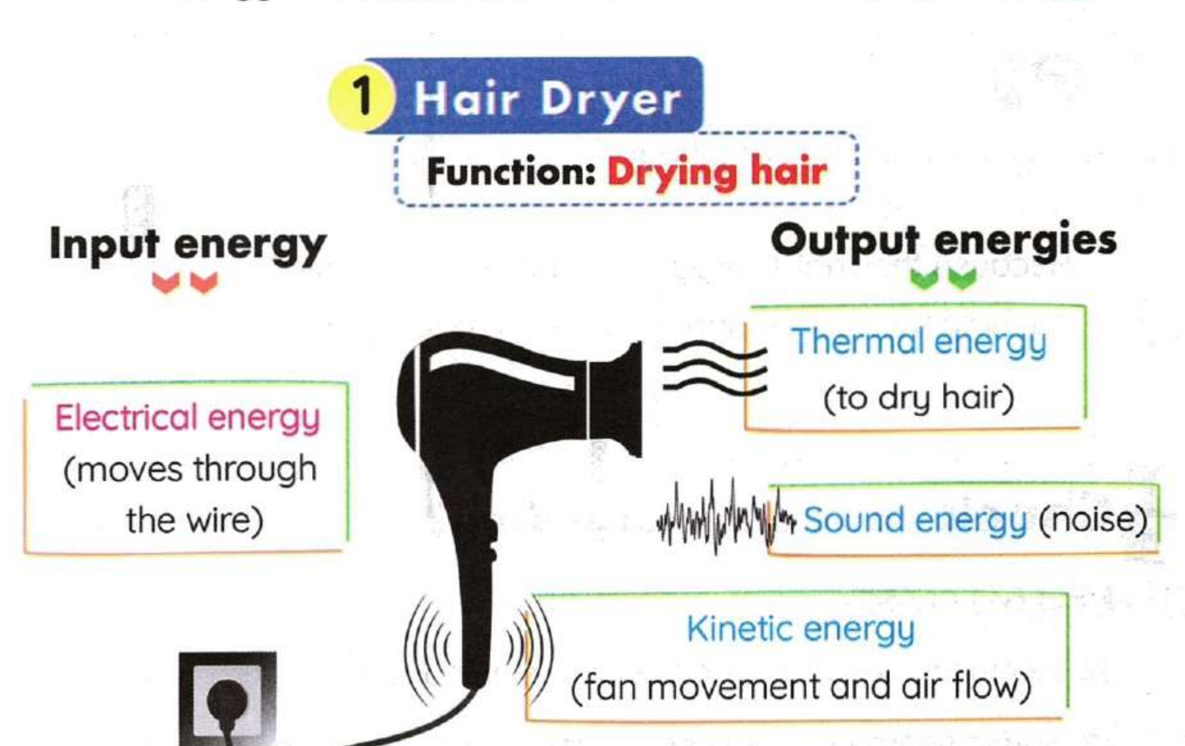
» Put (✓) or (✗):

1. Thermal energy helps the electric bulb do its function. ( )
2. Kinetic energy helps the blender do its main job. ( )

- Energy is conserved. It is neither created nor destroyed.
- All the energy that goes into a device must eventually leave it in a different form.
- The energy that goes in the device is called "Input energy".
- The energy that comes out the device is called "Output energy".

1 Hair Dryer

Function: Drying hair

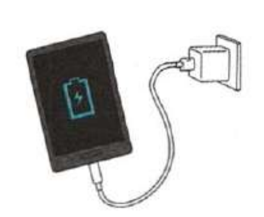


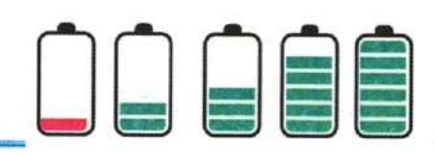


Noise from a hair dryer seems like "lost energy".
Because sound energy doesn't help the hair dryer do its main function.

2 Mobile Phone

Function: Light up – Ring – Process information







Input energy		Output energy
Electrical energy (when charging the phone.)	electrical energy is stored in battery in a form of chemical energy.	Light energy and sound energy



When using a mobile phone for a long time, some energy is lost.
Because thermal energy is produced and it does not help the mobile phone do its main functions.



Check your understanding?

Put (✓) or (✗):

1. Electrical energy is used to operate hair dryer. ( )
2. Sound energy is produced in both the hair dryer and mobile phone. ( )
3. Thermal energy helps the mobile phone to do its main job. ( )
4. Some of the output energies don't perform the device's function. ( )



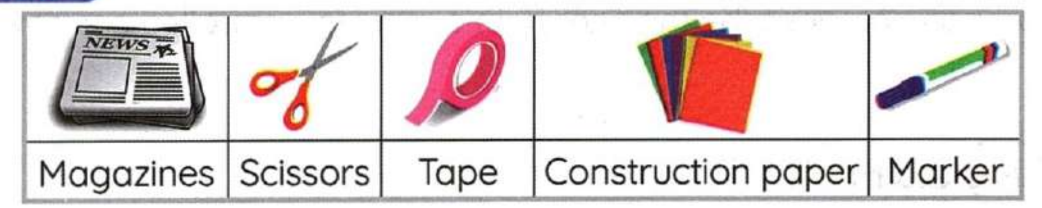
Activity  9 Build an Energy Chain

Experiment

» In this activity, we will build an energy chain that shows the flow of energy and energy transformations.

• في هذا النشاط، سوف نقوم ببناء سلسلة طاقة تُوضّح مسارات انتقال الطاقة وتحوُّلات الطاقة.

Tools:



Magazines	Scissors	Tape	Construction paper	Marker

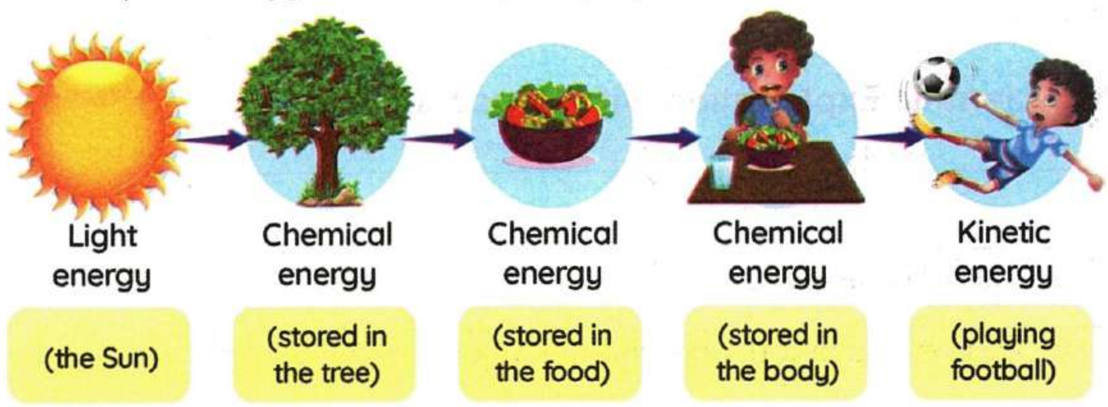
Steps:

1. Use the **scissors** to collect pictures from **magazines** that help you build an energy chain.
2. Label each picture in a suitable place on the **construction paper** using the **tape**.
3. Use the **marker** to illustrate the kind of energy for each picture.

(The energy chain must be at least 5 stages)

Result:

For example: Energy chain during playing football







Activity 10 Record Evidence Like a Scientist Energy in Remote-Controlled Cars

» You have learned a lot about energy transformations and how different devices get the energy that they need to operate.

Question:

» How can you describe the energy in a remote-controlled car now?

My Claim:

» ....

....

....

Evidence:

» ....

....

....

Scientific Explanation with Reasoning:

» ....

....

....

Exercises on Lesson 4

1 Choose the correct answer:

1. During charging a mobile phone, the .... energy is stored in battery as .... energy.
   - a. chemical - electrical
   - b. electrical - chemical
   - c. electrical - sound
   - d. chemical - light
2. When operating devices for a long time, ... energy is produced as lost energy that doesn't help the devices to do any function.
   - a. chemical
   - b. electrical
   - c. thermal
   - d. sound
3. All the following are from the consumed or produced energies in the mobile phone, except the ....
   - a. chemical energy
   - b. light energy
   - c. sound energy
   - d. potential energy
4. All the following things store chemical energy, except ....
   - a. trees
   - b. the light bulb
   - c. the human body
   - d. batteries
5. Thermal energy is not considered as a lost energy in the ....
   - a. mobile phone
   - b. washing machine
   - c. electric fan
   - d. hair dryer
6. .... energy is the output energy that helps the washing machine do its function.
   - a. Kinetic
   - b. Sound
   - c. Thermal
   - d. Electrical

2 Put (✓) or (✗):

1. The produced sound energy helps the hair dryer do its function. ( )
2. Energy can be transformed from one form to another. ( )
3. Sound energy produced by the electric mixer helps it do its function. ( )

4 The amount of energy entering any device equals the sum of the energies produced from it. ( )

5 The amount of electric energy used to charge a mobile phone is greater than the produced light energy. ( )

6 All the energy that enters the device leaks out in the form of heat. ( )

3 Write the scientific term:

1 The lost energy produced from the blender and you can hear it.

(..................)

2 The lost energy when using the mobile for a long time.

(..................)

4 Choose from column (A) what suits it in column (B):

Column (A)	Column (B)
1 Chemical energy	a. it is lost energy when operating a mobile device for a long time.
2 Light energy	b. it is used to charge the mobile battery.
3 Electrical energy	c. it is stored inside the mobile battery.
4 Thermal energy	d. it is produced from the mobile phone.

1 .... 2 .... 3 .... 4 ....

5 Give reasons for:

1 Sound energy produced from the blender is a lost energy.

....

2 Thermal energy produced from the electric heater isn't lost energy.

....

6 What happens if?

You operate your mobile device for a long time?

....

Model Exams on Concept 3.1

Model Exam 1

Question 1

(A) Choose the correct answer:

1. The produced .... energy doesn't help the blender do its job.
   a. sound b. kinetic c. chemical d. potential
2. Curiosity Rover is designed to explore ....
   a. the Sun b. the moon c. Mars d. Earth
3. Electric wires are made of .... material.
   a. plastic b. wood c. iron d. copper
4. All the following devices produce thermal energy, except the ....
   a. hair dryer b. watch c. kettle d. electric heater

(B) Write the scientific term:

The energy produced when the wood of trees is burned. (............)

Question 2

(A) Put (✓) or (✗):

1. Operating remotely means being controlled from a distance. (   )
2. Energy can't be transformed from one form to another. (   )
3. The amount of electric energy used to charge a mobile phone is greater than the amount of light energy produced. (   )
4. When you rub your hands, kinetic energy changes to heat energy. (   )

(B) Cross out the odd word: Food – Battery – Lamp – Coal (............)

Question 3

(A) Choose from column (A) what suits it in column (B):

(A)	(B)
1. Chemical energy	a. it is lost energy when operating a mobile device for a long time.
2. Light energy	b. it is used to charge the mobile battery.
3. Electrical energy	c. it is stored inside the mobile battery.
4. Thermal energy	d. it is produced by the mobile phone.

(B) Give a reason for:

Noise from a hair dryer seems to be "lost energy".

Model Exam 2

Question 1

(A) Choose the correct answer:

1. Batteries store .... energy inside them.
   a. chemical   b. electrical   c. solar   d. kinetic
2. During riding a bike, some kinetic energy is converted into .... energy due to the friction of the bike's tire with the road.
   a. chemical   b. potential   c. thermal   d. electrical
3. The .... uses the thermal energy to do its function.
   a. mobile phone   b. washing machine   c. TV   d. hair dryer
4. Some energy is lost in most devices in the form of .... energy.
   a. electrical   b. thermal   c. sound   c. kinetic

(B) Write the scientific term:

The lost energy when using a computer. (..................)

Question 2

(A) Put (✓) or (✗):

1. Mars is located a few kilometers away from Earth. (   )
2. The energy chain of a burning candle is composed of chemical energy converted into thermal energy and light energy. (   )
3. There's no lost energy when you turn on washing machine. (   )
4. The produced sound energy helps the blender do its function. (   )

(B) Cross out the odd word:

Hairdryer – Blender – Washing machine – Light bulb. (..................)

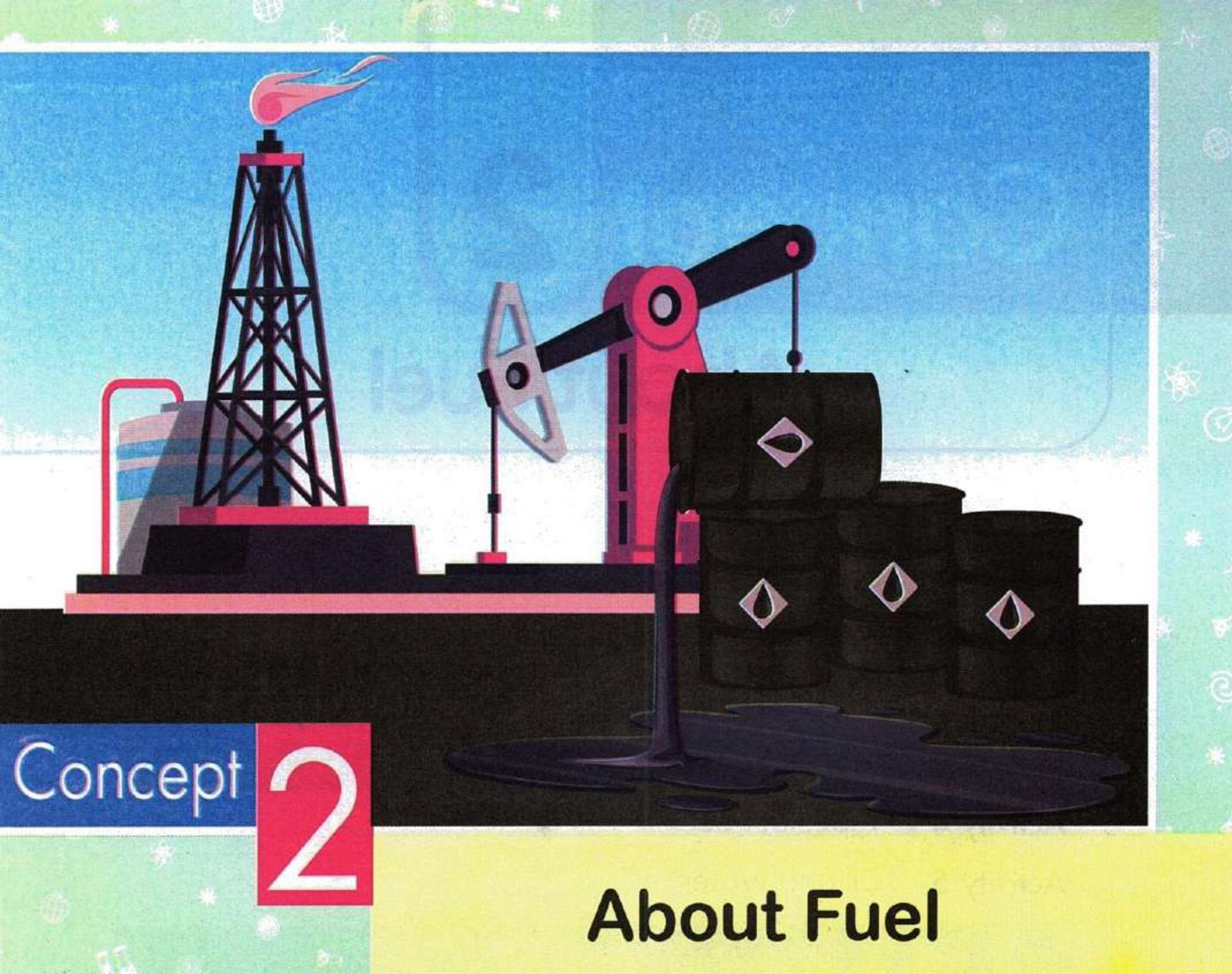
Question 3

(A) Complete the following table:

Device	Input Energy	Output Energy
1 Blender	....	....
2 Kettle	....	....
3 Hand bell	....	....

(B) What happens if?

You turn on an electric fan? (According to energy changes).



Concept 2

About Fuel

Concept Objectives:

By the end of this concept:

- Students can describe patterns in how different types of fossil fuel are formed and predict the properties and uses of different types of fossil fuel.
- Students can describe how the use of energy and fuel affects the environment.

Key Vocabulary:

- Energy efficiency
- Fossil fuel
- Fuel
- Generate energy
- Pollution
- Renewable energy resources
- Nonrenewable energy resources

Concept 2

About Fuel

Lesson 1

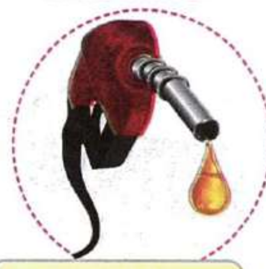




Activity 1 Can You Explain?



» Humans use many forms of fuel in their daily lives, such as:

Gasoline	Natural gas	Coal
		
used in moving cars.	used in cooking.	used in warming.

Fuel: A substance that produces thermal energy when it is burned.



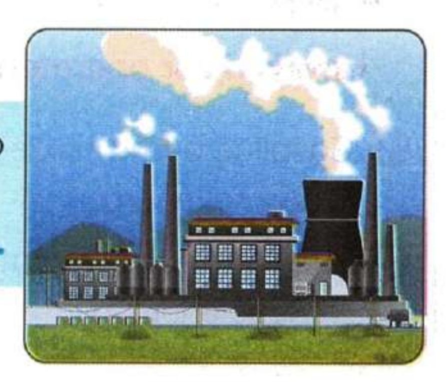
- Gasoline is made up of oil.
- Oil, coal, and natural gas are extracted from the underground.

• البنزين هو وقود مشتق من النفط.

• يُستخرج النفط والفحم والغاز الطبيعي من باطن الأرض.

- Fuel is burned in electric power stations to generate electricity.

• يحترق الوقود في محطات الطاقة لتوليد الكهرباء.







Activity 2 Fuel and Road Trips



Unit 3

Choose the correct answer:

1. Cars need .... to move. (food - fuel)
2. As the speed of the car increases, the amount of used fuel .... (decreases - increases)

If the fuel runs out, the car will stop moving.



When going on long trips in the car, we must check the gasoline pointer.

If you notice a drop in the gasoline pointer, you should go to the nearest gas station.



• عند الذهاب في رحلات طويلة باستخدام السيارة، يجب أن نتحقّق من مؤشر الوقود.

• إذا لاحظت انخفاضًا في مؤشر البنزين، فيجب أن تذهب إلى أقرب محطة وقود.

How is a car operated?





1. Gasoline burns inside the car's engine. (Thermal energy)
2. The car's engine rotates the wheels of the car. (Kinetic energy)

• يحترق الوقود في محرك السيارة، فيتمكّن المحرك من تدوير عجلات السيارة.





Activity 3 What Do You Already Know About Fuel?

- We use fuel in many different ways every day.
- Fuel stores chemical energy inside it.
- Fuel is used as a source of thermal energy when it is burned.

Uses of Some Types of Fuel



Gasoline or natural gas are used in operating all means of transportation.

Oil, natural gas, or coal are used in generating electricity.





Coal or wood are used in warming houses.

Coal, natural gas, or wood are used in cooking food.



Exercises on Lesson 1

1 Choose the correct answer:

1. All the following are found deeply under the Earth's surface, except ....
   a. coal b. oil c. natural gas d. green plants
2. .... is considered as the main source of energy on the Earth.
   a. A plant b. The Sun c. The moon d. Fuel
3. Cars need .... to move on the road.
   a. batteries b. water c. coal d. gasoline
4. As fuel burns inside the ...., the wheels of the car rotate.
   a. tires b. battery c. engine d. airbag
5. .... energy is stored inside coal.
   a. Thermal b. Solar c. Chemical d. Electrical
6. If we are going on a long trip in the car, we must check the ....
   a. seats b. engine
   c. speedometer d. gasoline pointer
7. Coal is used in all the following purposes, except ....
   a. warming houses b. watching the TV
   c. cooking food d. boiling water
8. .... is /are used in operating all means of transportation.
   a. Gasoline b. Coal c. Natural gas d. a and c
9. Fuel is used as a source of .... energy.
   a. thermal b. chemical c. light d. solar
10. You can burn .... to feel warm in your home in winter.
    a. gasoline b. coal c. wood d. b and c

2 Put (✓) or (✗):

1. Oil, coal, and natural gas are extracted from underground. ( )
2. As the speed of the car increases, the amount of used fuel decreases. ( )
3. Short trips consume more fuel than long trips. ( )
4. We cannot drive a car if the gasoline inside the fuel tank runs out. ( )
5. When the gasoline pointer is close to zero, it means you need to recharge the car batteries quickly. ( )
6. Coal can be used to move our cars if they stop suddenly. ( )
7. Thermal energy is produced by burning a piece of wood. ( )
8. Water could be used to warm our houses on cold winter days. ( )
9. Cars, buses, and bicycles need gasoline to run on roads. ( )

3 Write the scientific term:

1. The main source of most forms of energy on Earth. (..........)
2. A device that helps the car driver check the amount of fuel. (..........)
3. A liquid fossil fuel that burns inside the car engine. (..........)
4. The kind of energy that is stored in fuel. (..........)
5. A form of energy produced by burning fuel. (..........)

4 Complete the following using the words between the brackets:

(Oil - coal - gasoline pointer - electricity - wood - underground - Fossil fuel)

1. ...., such as coal and natural gas are found ....
2. When the .... is near to zero, you must go fast to the nearest gas station.
3. Some forms of fuel, such as .... and .... can be used in warming.
4. ...., natural gas, and coal are used in electric power stations to generate electricity.

Unit 3

5 Choose from column (A) what suits it in column (B):

A

Column (A)	Column (B)
1 Gasoline pointer	a. gasoline burns inside it.
2 In a car engine,	b. makes the car move and stop.
3 Car wheels	c. helps us check fuel in the car.

1 .... 2 .... 3 ....

B

Column (A)	Column (B)
1 Chemical energy	a. it is generated in power plants.
2 Kinetic energy	b. it is stored inside fuel.
3 Thermal energy	c. it is produced when the car wheels rotate.
4 Electrical energy	d. it is produced when burning a piece of coal.

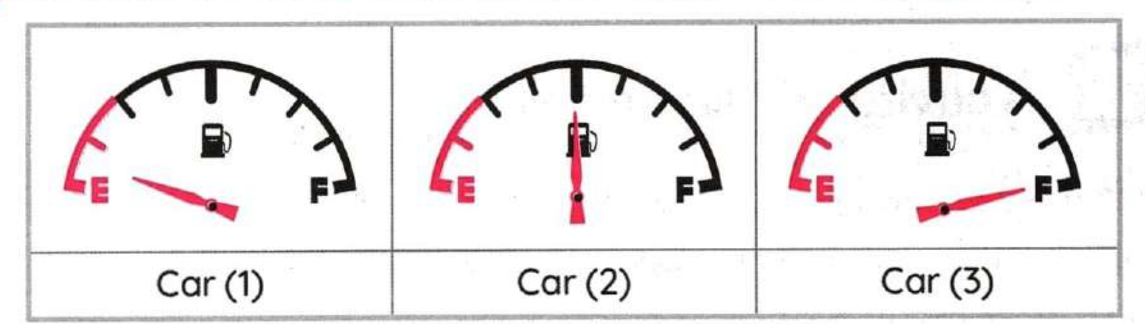
1 .... 2 .... 3 .... 4 ....

C

Column (A) Usage	Column (B) Fuel
1 Warming houses	a. Coal, natural gas, or wood
2 Operating cars	b. Coal or wood
3 Generating electricity	c. Oil, natural gas, or coal
4 Cooking food	d. Gasoline or natural gas

1 .... 2 .... 3 .... 4 ....

6 Study the following figures, then complete the following questions:



1. This device is called .... and it helps the driver check the ....
2. The driver in car (........) needs to go quickly to the nearest gas station.
3. The fuel tank is full with gasoline in car (..........).
4. Half the amount of gasoline is remaining in car (..........).

7 Give reasons for:

1. Gasoline is very important for cars to move.
   ....
2. The fuel (gasoline) pointer is very useful for drivers.
   ....

8 What happens if?

1. We burn a piece of coal?
   ....
2. The fuel pointer in the car becomes zero?
   ....
3. Gasoline is burned inside the car's engine?
   ....

Lesson 2



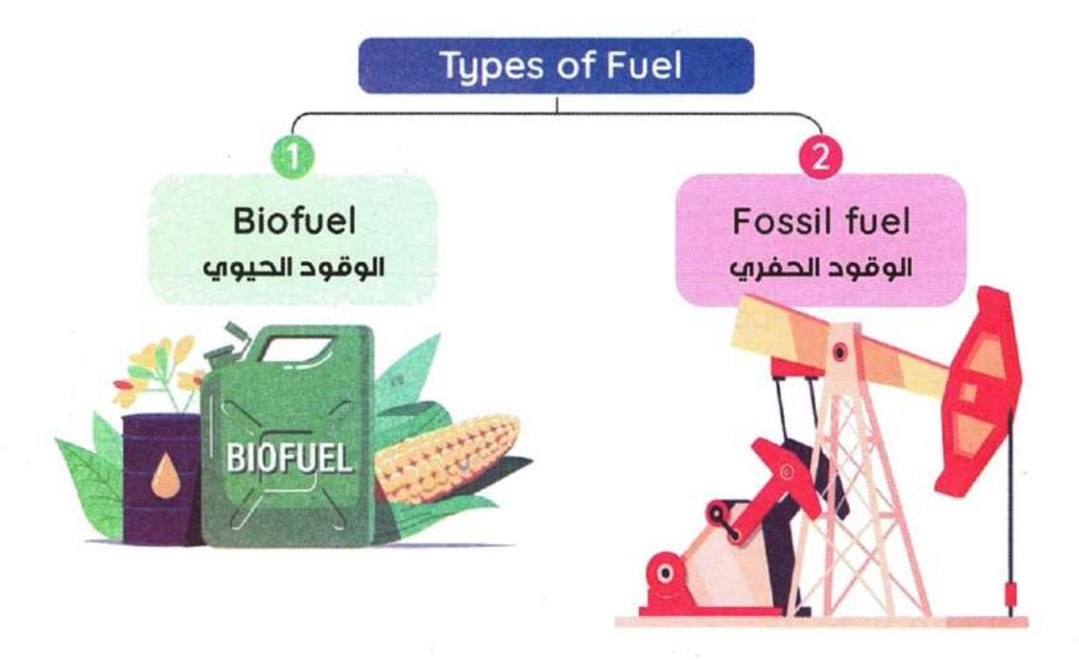
Activity 4 Types of Fuel

» Put (✓) or (✗):

1. Gasoline is a liquid that is used as fuel for cars. (   )
2. Both coal and wood are used in warming. (   )

Fuel: It is a material that releases thermal energy when burned.

الوقود: هو مادة تُنْتِج طاقة حرارية عند حرقها.



Give reasons for...

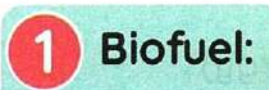


1. **Biofuel is considered a renewable source of energy.**

   Because it is renewed by the continuous growth of plants.

2. **Fossil fuel is considered a nonrenewable source of energy.**

   Because they are gone and cannot be easily renewed.



Concept 2

1 Biofuel: (Renewable resource of energy)

- It is the fuel that is made from living things that can be planted.

الوقود الحيوي: هو الوقود الذي يُنْتَج من الكائنات الحية التي يمكن زراعتها.

Examples:

Wood



Grass



Corn



- **Wood** is the most ancient fuel; it is still used all around the world.
- **Charcoal** is made from wood.
- **Liquid fuel** is made from grass, corn, and wood chips.

- يُعتبر الخشب من أقدم أنواع الوقود، وما زال يُستخدم في جميع أنحاء العالم. • يُصنع الفحم النباتي من الخشب.
- يمكن تحويل العشب والذرة ورقائق الخشب إلى وقود حيوي سائل.

Biofuel Conservation





1. Using wood as fuel requires **cutting down trees**.
2. Cutting down trees at a faster rate leads to **deforestation**.
3. Deforestation has a **negative impact** on our environment.

- استخدام الخشب كوقود يتطلب قَطْع الأشجار. • قَطْع الأشجار بوتيرة سريعة يؤدي إلى إزالة الغابات.
- إزالة الغابات لها تأثير سلبي على بيئتنا المحيطة بنا.

NOTE:

- Some trees grow a few centimeters every year and reach their full height in more than one person's lifetime.

- هناك أشجار تنمو سنتيمترات قليلة كل عام، ويستغرق اكتمال نموها مدة أطول من عُمْر الإنسان.

2 Fossil fuel: (Nonrenewable resource of energy)

- It is the fuel that was formed from the remains of plants and animals that were buried and decomposed over millions of years ago.

Examples:

Coal	Oil	Natural gas	Gasoline
			

» Coal is formed from the decomposition of ancient plants remains.

» Oil and natural gas are formed by the decomposition of the remains of ancient sea animals.

» Gasoline is a fuel that is formed from oil.

- يتكوَّن الفحم من تحلُّل بقايا النباتات الجافة القديمة.
- يتكوَّن النفط والغاز الطبيعي من تحلُّل بقايا الكائنات البحرية القديمة.
- البنزين هو وقود مشتق من النفط.

- Fossil fuel are extracted from underground.
- Fossil fuel are formed very slowly over millions of years, which means that we use them faster than they are formed.



- الوقود الحفري يُستخرج من باطن الأرض.
- تَشَكَّل الوقود الحفري ببطء شديد على مدى ملايين السنين، وهذا يعني أننا نستخدمه بشكل أسرع من معدل تكوُّنه.

Formation of Coal

1. Over millions of years ago, large areas of Earth were covered with plants and swamps.
2. When these plants died, their remains were covered with hundreds of meters of mud and rocks under the Earth's surface.
3. Earth's heat and pressure turned these remains into coal.

1 منذ ملايين السنين، كانت مساحات كبيرة من الأرض مغطاة بالأشجار والمستنقعات.
2 عندما ماتت تلك النباتات، غطتها مئات الأمتار من الطين والصخور تحت سطح الأرض.
3 بفعل الحرارة والضغط تحوّلت بقايا النباتات الجافة إلى فحم.

Important Comparisons

P.O.C	Fossil Fuel	Biofuel
Definition	It is the fuel that was formed from the decomposition of plants and animals remains that lived millions of years ago.	It is the fuel that is made from living things that can be planted.
Examples	1 Coal 2 Oil 3 Natural gas 4 Gasoline	1 Wood 2 Grass 3 Corn 4 Charcoal 5 Liquid fuel
Primary Source	The Sun	
Renewable or Nonrenewable	Nonrenewable resource	Renewable resource



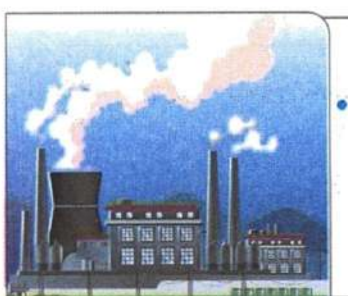
Activity 5 Oil and Water

Unit 3

- Oil and water are two types of resources that humans can use.
- There are some similarities and differences between oil and water.

Oil and Water

1 Similarities



- Both oil and water can be used to generate electricity.

• يمكننا استخدام النفط والماء لتوليد الطاقة الكهربية.



2 Differences

- Oil is a nonrenewable resource, while water is a renewable resource.

• النفط مورد غير متجدد، بينما الماء مورد متجدد.

Nonrenewable resources

- They are natural resources that are used faster than they can be replaced.

• المصادر غير المتجددة: هي مصادر طبيعية تُسْتَهْلَك بمعدل أسرع من معدل تجدُّدها.

Renewable resources

- They are natural resources that can be replaced soon after they are used.

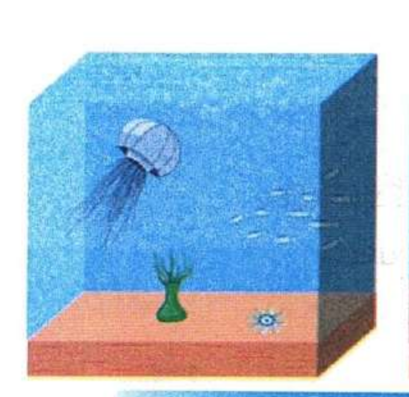
• المصادر المتجددة: هي مصادر طبيعية تتجدَّد بعد وقت قصير من الاستخدام.

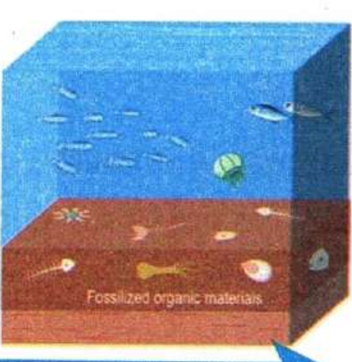


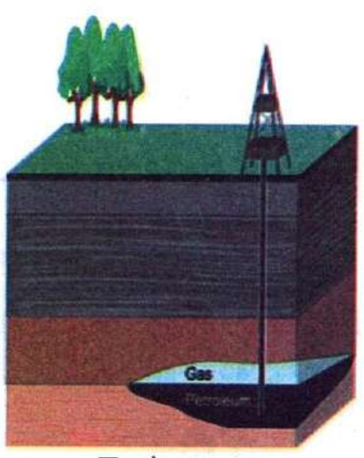
1 Oil: Nonrenewable resource of energy

- **Oil** is extracted from underground.
- **Oil** is formed from the decomposition of **ancient sea creatures**.

Formation of Oil







Millions of years — Today

Over many millions of years ago,

- marine organisms died, their remains settled on the sea floor.

↓

- Layers of sediments and rocks cover the remains of the marine organisms.

↓

- Over time, those remains were converted into oil due to extreme heat and pressure.

- منذ ملايين السنين، ماتت الكائنات البحرية واستقرت في قاع المحيط.
- تراكمت طبقات الصخور والرواسب على الكائنات البحرية المدفونة.
- مع مرور الوقت، تحوّلت تلك البقايا إلى نفط تحت تأثير الضغط والحرارة الهائلين.

2 Water

- Although water is renewable, we must use it carefully and not waste or pollute it.
- If we waste or pollute water, it may not be replaced as quickly as we need.

• على الرغم من أن المياه مصدر متجدد، إلا أنه يجب علينا استخدام المياه بحرص وعدم إهدارها أو تلويثها.
• إذا قمنا بإهدار المياه أو تلويثها، فقد لا نستطيع تجديد المياه بالسرعة والمقدار الذي نحتاجه.

Give a reason for...



- Water is considered a renewable resource of energy.

Because water is available and hasn't run out yet.



How can we conserve these resources



We can conserve oil by:

1. Driving less.
2. Using public transportation.



We can conserve water by:

1. Growing plants that don't require a lot of watering.
2. Avoid polluting water.



Exercises on Lesson 2

1 Choose the correct answer:

1. .... is considered the main source of energy on the Earth's surface.
   a. Wind b. Fuel c. The Sun d. Water
2. All the following are extracted from underground, except ....
   a. coal b. charcoal c. petroleum d. natural gas
3. Ancient people used .... as a form of fuel before discovering gasoline.
   a. wind b. wood c. oil d. coal
4. .... is a renewable resource of energy.
   a. Oil b. Coal c. Gasoline d. Corn
5. All the following represent renewable resources of energy, except ....
   a. wood b. coal c. charcoal d. grass
6. Coal is formed due to the decomposition of ancient dead ....
   a. plants b. animals c. humans d. birds
7. .... is made from wood.
   a. Gasoline b. Charcoal c. Grass d. Natural gas
8. All the following are used to make liquid fuel, except ....
   a. wood chips b. corn c. charcoal d. grass
9. Charcoal is described by ....
   a. being limited b. existing underground
   c. being a fossil fuel d. being made from wood
10. Natural gas is formed from the decomposition of .... under extreme pressure and temperature.
    a. plants and animals b. sea creatures
    c. birds d. trees

11 .... takes millions of years to be formed.

a. Coal b. Charcoal c. Wood d. Corn

12 One of the disadvantages of overusing biofuel is ....

a. overfishing b. wildfire c. deforestation d. rain

13 Both water and oil ....

a. are renewable resources b. are nonrenewable resources

c. have the same structure d. can be used to generate electricity

2 Put (✓) or (✗):

1 The Sun is the primary source of forming both biofuel and fossil fuel. (   )

2 Coal is the oldest fuel that has been used all over the world by ancient people. (   )

3 Biofuel is one of the nonrenewable sources of energy. (   )

4 Fossil fuel is made from living things that can be planted. (   )

5 All types of fuel are extracted from underground. (   )

6 The consumption rate of coal is slower than its formation rate. (   )

7 Burning fossil fuel causes deforestation and pollution. (   )

8 The amount of oil, water, and air on Earth is limited. (   )

9 We can conserve oil by using public transportation. (   )

10 Water may not be replaced as quickly as we need. (   )

11 We should plant crops that need a large amount of water to conserve water. (   )

12 Some plants are used to make liquid biofuel. (   )

3 Write the scientific term:

1 The main source of energy for most forms of energies on Earth. (..................)

2 A material that releases thermal energy on burning. (..................)

3 It is a natural resource that is used faster than it can be replaced. (..................)

4 It is a natural resource that can be replaced soon after it is used. (..........)

5 It is the fuel that is made from living organisms that can be planted. (..........)

6 It is the fuel that is extracted from deep ground under the Earth's surface. (..........)

7 A kind of fossil fuel that is produced from the decomposition of dead marine organisms. (..........)

8 A fossil fuel that is produced from the decomposition of dead plants. (..........)

9 A kind of biofuel that is made from wood of trees. (..........)

10 A kind of biofuel that is made from corn and grass. (..........)

11 A phenomenon that happens by cutting trees at a faster rate to get biofuel. (..........)

4 Complete the following using the words between the brackets:

A (wood - deforestation - underground - oil)

1 Ancient people used .... in cooking food and warming.

2 Gasoline is made from ...., while coal is extracted from ....

3 Cutting trees with a fast rate causes ....

B (coal - heat - increased - Oil - nonrenewable - decreased - renewable - pressure)

1 Extreme .... and .... are the factors needed for the formation of fossil fuel underground.

2 .... is formed from the decomposition of a shark's remains, while .... is formed from the decomposition of trees' remains.

3 Water is considered a/an .... resource of energy, where oil is a/an .... resource of energy.

4 The rate of consumption of fossil fuel must be ....

5 Choose from column (A) what suits it in column (B):

A

Column (A)	Column (B)
1 The Sun	a. takes a very long time to be formed.
2 Fossil fuel	b. takes a short time to be formed.
3 Biofuel	c. is the primary source of all kinds of energy.

1 .... 2 .... 3 ....

B

Column (A)	Column (B)
1 Liquid fuel	a. was used by ancient people.
2 Gasoline	b. is made from grass, corn, and wood chips.
3 Charcoal	c. is a fuel that is made from oil.
4 Wood	d. is made from wood.

1 .... 2 .... 3 .... 4 ....

6 Classify these environmental changes in the following table:

Oil – Charcoal – Gasoline – Natural gas – Corn –
Grass – Wood – Coal – Water – Wind

Renewable Resource of Energy	Nonrenewable Resource of Energy
....	....
....	....
....	....
....	....

7 Arrange the following steps according to the formation of coal:

a (......) The tree has been transformed into coal over millions of years.

b (......) The tree remains are buried under the Earth's surface.

c (......) The tree remains are exposed to high pressure and temperature.

d (......) An old tree died.

8 Arrange the following steps according to the formation of oil:

a (......) They fall on the bottom of oceans.

b (......) The organisms are exposed to high pressure and temperature.

c (......) They are covered with rocks and sediments.

d (......) Some marine organisms died.

e (......) Over millions of years, these remains are transformed into oil.

9 Cross out the odd word:

1. Wood – Oil – Corn – Charcoal. (..................)
2. Sun – Wind – Water – Coal. (..................)
3. Coal – Charcoal - Natural gas – Oil. (..................)
4. Grass – Wood chips – Corn - Coal. (..................)

10 Compare between:

A

P.O.C	Fossil Fuel	Biofuel
Renewable or Nonrenewable	....	....
Examples	....	....

B

P.O.C	Coal	Charcoal
Type of Fuel	....	....
Primary Source	....	....
Renewable or Nonrenewable	....	....

11 Give reasons for:

1. Fossil fuel is considered a nonrenewable resource of energy.

   ....

2. Biofuel is considered a renewable resource of energy.

   ....

3. Cutting trees at a faster rate to get wood has a negative impact on our environment.

   ....

4. Coal is considered a type of fossil fuel.

   ....

12 What happens if?

1. The marine creatures remainings decompose under the Earth's surface?

   ....

2. We cut down trees at a faster rate than they can grow?

   ....

3. The remains of dead plants are exposed to extreme heat and pressure?

   ....

Lesson 3




Activity 6 Fossil Fuel Formation

» The following are the steps involved in the formation of fossil fuel, write them in the correct order:

- (..........) The remains are changed to become coal, oil, and natural gas.
- (..........) The remains were buried.
- (..........) Living things that lived a long time ago died.
- (..........) Heat and pressure affected the remains.



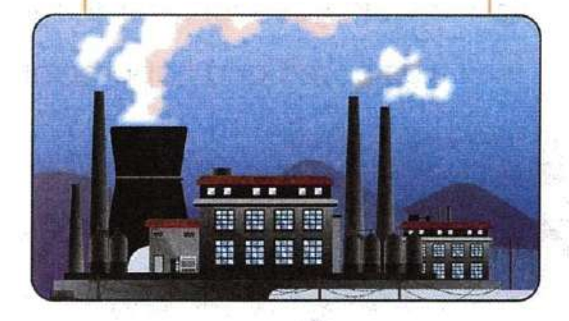

Activity 7 Living Without Electricity

Electricity can be generated from

1. **Renewable Resources**
   Such as
   (Water - Wind)



2. **Nonrenewable Resources**
   Such as
   (Oil – Natural gas)



» In many regions, electricity is generated from nonrenewable resources.

» Using renewable resources is beginning to increase.

Whatever the resource of energy is renewable or nonrenewable, we should conserve it.



Experiment

In this activity, we will document your experience of spending some time without using electricity.

• في هذا النشاط، سوف تُسجِّل ملاحظاتك عن قضاء بعض الوقت بدون استخدام الكهرباء.

Steps:

1. Turn off all the electricity in the house for two hours.
2. Write about your experience and answer the following questions:

Questions and answers:

a) Do you see anything in the dark?

- I can't see anything in the dark.

b) What are the devices you have used?

- I've used a candle instead of the lamp.
- I've used a paper and a pen instead of a computer.

c) How did you feel after this experience?

- I was bored and I appreciate electricity more now.

Conclusion:

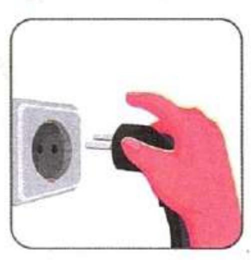
Electricity is very important in our lives and we should conserve it.



How can we conserve electricity



1. Turn off the lights we don't need.
2. Unplug electrical devices after using them.
3. Set a regular electricity-free time.





Activity  Using Fossil Fuel to Generate Electricity

» Put (✓) or (✗):

1. We should let electric devices work all the time. ( )
2. We can conserve electricity by using saving light bulbs. ( )

Generating Electricity Using Fossil Fuel

1 Fuel burns

2 Steam rises

3 Turbines turn

4 Generator spins

5 Electrical energy is transferred to homes.



Fuel burns

- When fuel (coal, oil, or natural gas) burns, it releases thermal energy.



Steam rises

- This thermal energy is used to heat water to produce steam.



Turbines turn

- The steam is directed to tubes to turn turbines.



Generator spins

- Turbines make the generator spin and convert kinetic energy into electrical energy.

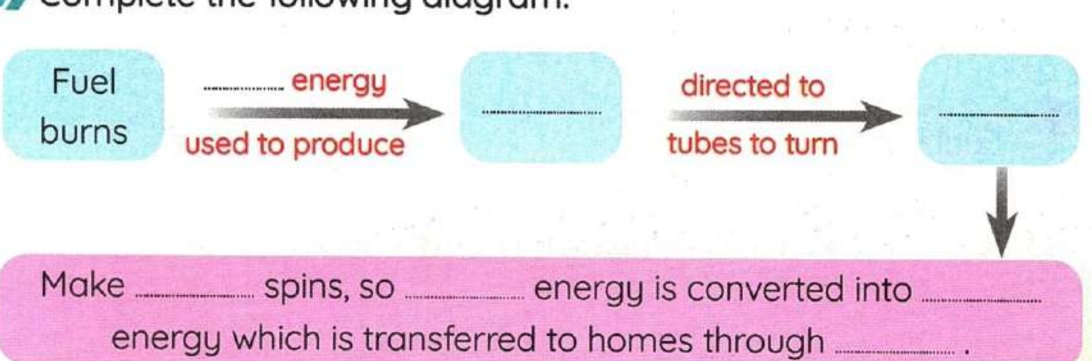
5 Electrical energy is transferred to homes

- Electrical energy travels through cables to homes, businesses, and factories.

1 حرق الوقود	عندما يحترق الوقود (الفحم أو النفط أو الغاز الطبيعي) يُنْتِج طاقة حرارية.
2 يرتفع البخار	تُستخدم هذه الطاقة الحرارية في تسخين المياه لتكوين بخار الماء.
3 تتحرك التوربينات	يُوجَّه البخار إلى أنابيب لتشغيل التوربينات.
4 يدور المولد	تعمل التوربينات على دوران المولد؛ وبالتالي يتم تحويل الطاقة الحركية إلى طاقة كهربية.
5 نقل الطاقة الكهربية للمنازل	تنتقل الطاقة الكهربية عبر الكابلات إلى المنازل والشركات والمصانع.

Check your understanding?

» Complete the following diagram:



Exercises on Lesson 3

1 Choose the correct answer:

1. In many regions, ... is generated from nonrenewable resources.
   a. oil b. natural gas c. electricity d. wood

2. .... is used instead of lamps when electricity is turned off.
   a. Candle b. Wool c. Paper d. Radio

3. How can you conserve electricity?
   a. By turning off the lights when I don't need them.
   b. By unplugging electrical appliances.
   c. By setting a regular electricity-free time.
   d. All answers are correct.

4. .... energy is produced by burning fuel.
   a. Chemical b. Sound c. Thermal d. Solar

5. By heating water, it turns into ....
   a. steam b. ice c. electricity d. fuel

6. .... change kinetic energy into electrical energy in the power plants.
   a. Engines b. Generators c. Wires d. Fuel

7. The steam produced in the electric power station is directed to tubes to turn ....
   a. turbines b. motors c. mills d. lamps

8. Electrical energy travels through .... to homes and factories.
   a. tubes b. motors c. cables d. fans

9. .... and .... are included in fossil fuel's formation.
   a. Heating - cooling b. Burying - cooling
   c. Decaying - heating d. Decaying - growth

10 Water is turned into steam by the effect of .... energy.

a. electrical b. thermal c. kinetic d. mechanical

Unit 3

2 Put (✓) or (✗):

1. The movement of a generator in an electric power station produces potential energy. ( )
2. Water is a nonrenewable resource. ( )
3. We can use renewable and nonrenewable energy resources to generate electricity. ( )
4. Turbines are operated by steam in electric power stations. ( )
5. Turning on the lights that we do not need helps us conserve electricity. ( )
6. Turbines make the generator spin to generate electrical energy. ( )
7. Using energy-saving light bulbs conserves electricity. ( )
8. You should unplug an electric iron after using it. ( )
9. On cooling water, it turns into steam in electric power stations. ( )

3 Write the scientific term:

1. The energy resources that include wind energy and water energy. (..................)
2. The energy released from burning fossil fuel. (..................)
3. The energy produced by the generator. (..................)
4. A matter that is produced from heating water in an electric power station. (..................)
5. A device that operate generators. (..................)
6. A device in an electric power station that changes the kinetic energy into electrical energy. (..................)

4 Complete the following using the words between the brackets:

(natural gas - generators - electric - coal - steam - kinetic)

1. Turbines in electric power stations are turned by ...., and they produce kinetic energy to run the .... of the electric power stations.
2. The electric generator changes the .... energy into .... energy.
3. Electricity is generated by burning .... or .... in electric power stations.

5 Choose from column (A) what suits it in column (B):

Column (A)	Column (B)
1 Generators	a. produces thermal energy.
2 Turbines	b. produce electrical energy.
3 Burning fuel	c. is produced from heating water.
4 Steam	d. produce kinetic energy.

1 .... 2 .... 3 .... 4 ....

6 Cross out the odd word:

1. Decomposition - Moonlight - Extreme heat - High pressure. (............)
2. Water - Oil - Coal - Natural gas. (............)

7 Arrange the following steps for generating electricity at an electric power station:

1. (.........) Steam starts to move the turbines.
2. (.........) The oil or natural gas burns to produce thermal energy.
3. (.........) Electricity is transferred through cables to cities.
4. (.........) The generator converts the kinetic energy into electrical energy.
5. (.........) Thermal energy is used to heat water and produce steam.

8 Give reasons for:

1. We should conserve electricity.

....

....

2. Generators play an important role in the electric power stations.

....

....

9 What happens if?

1. Oil is burned inside the electric power stations?

....

....

2. Steam produced from heating water is directed towards turbines?

....

....

3. Water is heated in electric power stations?

....

....

4. A generator is operated by the movement of turbines?

....

....



Lesson 4



Activity 9 Big City Environmental Concerns

• The increase in people's needs and their industrial and agricultural activities causes many pollution problems.

Sources of Pollution in Big Cities





1. **Burning fuel** produces smog that pollutes the air.



يَنْتُج عن حرق الوقود الضباب الدخاني الذي يلوث الهواء.

2. **Pesticides** used in farms are carried into streams when it rains, causing **soil** and **water** pollution.



المبيدات الحشرية المستخدمة في المزارع تختلط مع مياه الجداول عند سقوط الأمطار؛ مما يسبب تلوث التربة والمياه.

3. **Using chemicals** in factories pollutes the **air**, **water**, and **soil**.



المواد الكيميائية المستخدمة في المصانع تؤدي لتلوث الهواء والمياه والتربة.

Effects of Air Pollution on Humans' Health



Smog from cars and factories in big cities causes:

1. Irritation of **humans' eyes**
2. Irritation of **humans' lungs**
3. Damages the tissues of the respiratory system.

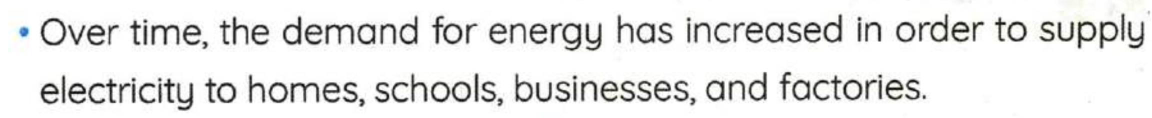
يتسبَّب الضباب الدخاني الصادر من السيارات والمصانع في المدن الكبرى في:

1 تهيُّج عيون الإنسان. 2 تهيُّج الرئة. 2 تدمير أنسجة الجهاز التنفسي.

NOTE:

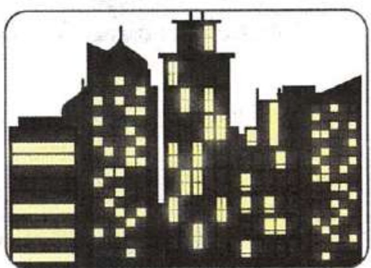
• Smog is full of harmful small particles that irritate the lungs and cause damage to the tissues of the respiratory system.





Activity 10 Burning Fossil Fuel and Pollution

- Over time, the demand for energy has increased in order to supply electricity to homes, schools, businesses, and factories.
- The solution was to **generate electricity** by burning fossil fuel at the power plants.

• بمرور الوقت، زاد الطلب على الطاقة من أجل توفير الكهرباء للمنازل والمدارس والشركات والمصانع.

• كان الحل هو حرق الوقود الحفري في محطات توليد الكهرباء لتوليد الكهرباء.

Harms of Burning Fossil Fuel

» Burning fuel produces **carbon dioxide gas,** which is considered the main reason for **acid rain** and **global warming**.

1 Acid Rain:



How it is formed:

- Carbon dioxide gas combines with water in the air to form **acid rain**.

Harms:

1. The death of trees.
2. Chemical changes in the structure of the soil.
3. Chemical changes in the structure of lakes cause the death of fish.
4. Decomposition of some rocks, including bricks of buildings.

[1] موت الأشجار. [2] التغيرات الكيميائية في تركيب التربة. [3] التغيرات الكيميائية في تركيب البحيرات؛ مما تسبب في موت الأسماك.

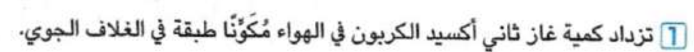
[4] تحلُّل بعض الصخور وطوب المباني.

2 Global Warming:

How it is formed:



1. The amount of carbon dioxide gas in the air increases forming a layer in the atmosphere.
2. This layer traps heat on the Earth, causing a slow rise in the Earth's temperature.



[1] تزداد كمية غاز ثاني أكسيد الكربون في الهواء مُكَوِّنًا طبقة في الغلاف الجوي.

[2] تَحبس هذه الطبقة الحرارة على الأرض؛ مما يؤدي إلى ارتفاع درجة حرارة الأرض ببطء.



How to reduce acid rain and global warming



- The only solution is to **conserve energy**.

• الحل الوحيد لوقف الأمطار الحمضية والاحتباس الحراري هو الحفاظ على الطاقة.

Reducing energy we use. → causes → Reducing the fossil fuel we burn. → causes → Reducing carbon dioxide we put in the air.

• ترشيد استهلاك الطاقة يُقلل حرق الوقود؛ مما يُقلل كمية غاز ثاني أكسيد الكربون في الهواء.





- Conserving fossil fuel makes them last longer and keeps the Earth clean.

• الحفاظ على الوقود يجعله يدوم لفترة أطول ويمنع تلوُّث كوكب الأرض.




Activity 11 Conserving Fossil Fuel

From the previous lessons, we have learned that:

- Fossil fuel is considered nonrenewable natural resource of energy.
- Fossil fuel takes millions of years to form, which means that they can't be replaced as quickly as we consume them.
- Fossil fuel will run out of the Earth if consumption is not rationalized.

Conserving Fossil Fuel

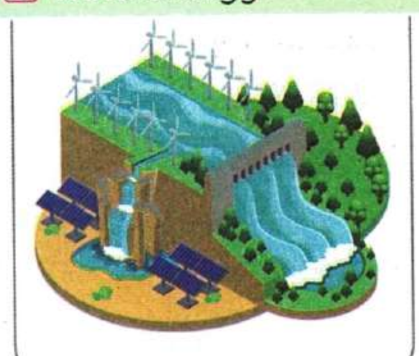
1. Walking or biking instead of driving a car.



2. Turning off the lights when you aren't in a room.



3. Replacing fossil fuel with renewable energy resources, such as:
   1. Solar energy.
   2. Hydroelectric energy.
   3. Wind energy.



NOTE:

- Using renewable energy resources to generate electricity is more expensive than using fossil fuel.

Disadvantages of Using Fossil Fuel

1. Fossil fuel is limited and could run out.
2. When fossil fuel burns, it emits gases that cause:

   a. Air pollution b. Acid rain c. Global warming

Lesson 5

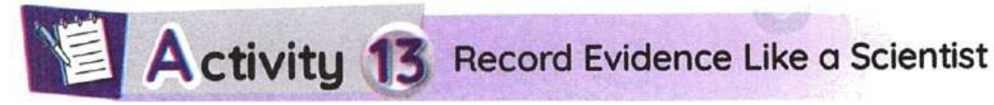


Activity 12 Using Fuel



» Classify the following resources in the following table:

P.O.C	Renewable	Nonrenewable
1 Coal		✔
2 Charcoal		
3 Wood		
4 Oil		
5 Natural gas		
6 Solar energy		
7 Wind energy		
8 Gasoline		
9 Water		
10 Liquid fuel		



Activity 13 Record Evidence Like a Scientist

Now, try to think like a scientist by writing your hypothesis (claim), your evidence, and your scientific explanation about one of the main points of this concept.

Question:

How can you describe fuel and road trips now?

My Claim:

....

....

....

Evidence:

....

....

....

Scientific Explanation with Reasoning:

....

....

....

Exercises on Lessons 4 and 5

1 Choose the correct answer:

1. Using chemicals in factories pollutes ....
   a. air
   b. water
   c. soil
   d. all the previous
2. Smog damages the tissues of the .... system.
   a. digestive
   b. circulatory
   c. respiratory
   d. nervous
3. Burning fossil fuel produces ....
   a. natural gas
   b. oxygen gas
   c. carbon dioxide
   d. oil
4. The death of trees is a result of ....
   a. overfishing
   b. acid rain
   c. wind
   d. temperature
5. Cars' smog causes irritation of humans' ....
   a. small intestine
   b. brains
   c. hearts
   d. eyes
6. Acid rain is formed when .... combines with water.
   a. oxygen
   b. carbon dioxide
   c. hydrogen
   d. nitrogen
7. The burning of fossil fuel causes ....
   a. global warming
   b. deforestations
   c. acid rain
   d. a and c
8. To reduce air pollution and global warming, we must ....
   a. not use public transportation
   b. turn on all home devices
   c. drive cars faster
   d. conserve fossil fuel
9. Using vehicles that are operated by .... conserves fossil fuel.
   a. natural gas
   b. solar energy
   c. electricity
   d. b and c
10. Increasing the amount of .... gas in the atmosphere causes global warming.
    a. hydrogen
    b. carbon dioxide
    c. oxygen
    d. nitrogen
11. Erosion of buildings and chemical changes in the soil are caused by ....
    a. global warming
    b. oxygen gas
    c. deforestation
    d. acid rain

12 When .... mixes with water of canals and rivers, it causes water and soil pollution.

a. carbon dioxide b. smog c. pesticides d. rain

13 Carbon dioxide traps .... in the atmosphere causes global warming.

a. gases b. water vapor c. pressure d. heat

14 Using .... to produce electric energy is expensive.

a. solar energy b. oil c. natural gas d. coal

15 Burning fossil fuel produces ....

a. thermal energy b. carbon dioxide

c. chemical energy d. a and b

16 Burning fossil fuel causes all the following, except ....

a. pollution b. acid rain

c. global warming d. deforestation

2 Put (✓) or (✗):

1 Acid rain causes soil and water pollution. ( )

2 When the burning rate of fossil fuel increases, the temperature of Earth decreases. ( )

3 Mixing water with oxygen gas produces acid rain. ( )

4 Acid rain can decompose some rocks. ( )

5 To reduce global warming, we must conserve nonrenewable resources of energy. ( )

6 The amount of fossil fuel on Earth is unlimited. ( )

7 Increasing the ratio of carbon dioxide in the air reduces the Earth's temperature. ( )

8 Acid rain leads to physical changes in the structure of lakes and soil. ( )

9 Burning fossil fuel causes global warming. ( )

10 Global warming is one of the disadvantages of using fossil fuel in energy generation. ( )

11 Acid rain irritates the humans' eyes and lungs. ( )

12 Large particles found in smog cause air pollution. ( )

3 Write the scientific term:

1. It is a phenomenon in which the Earth's temperature increases, when carbon dioxide gas increases in the air. (..........)
2. It is a substance that causes the decomposition of some rocks and the death of trees. (..........)
3. A gas that causes global warming and acid rain. (..........)
4. The energy resources that include solar energy and hydroelectricity. (..........)
5. The energy resources that include all kinds of fossil fuel. (..........)
6. It is released from cars and irritates humans' eyes and lungs. (..........)

4 Complete the following using the words between the brackets:

(climate - water - soil - renewable - air - nonrenewable - temperature)

1. To avoid air pollution, we must use .... resources of energy.
2. Global warming is a phenomenon that raises the .... of Earth and changes its ....
3. Smog causes .... pollution.
4. Pesticides cause .... and .... pollution.

5 Choose from column (A) what suits it in column (B):

Column (A)	Column (B)
1 Oil	a. causes global warming.
2 Water	b. runs out faster than wind.
3 Carbon dioxide	c. irritates our lungs.
4 Smog	d. is a renewable resource.

1 .... 2 .... 3 .... 4 ....

6 Arrange the following steps that explain formation of acid rain:

a (..........) The ratio of carbon dioxide gas increases.

b (..........) Acid rain is formed.

c (..........) Carbon dioxide combines with water vapor.

d (..........) It causes the death of trees and fish.

e (..........) Factories cause air pollution.

7 Compare between:

P.O.C	Acid Rain	Global Warming
Reason of Formation	....	....
Disadvantages	....	....

8 Give reasons for:

1 It is necessary to conserve energy.

....

2 Fossil fuel amount on Earth is limited.

....

3 Engineers work on improving solar vehicles.

....

4 Farmers should avoid the overuse of pesticides.

....

9 What happens if?

1 The ratio of carbon dioxide increases in the air?

....

2 The consumption of fossil fuel is not rationalized?

....

3 Acid rain falls on buildings?

....

4 Factories discharge a lot amount of chemicals into a city?

....

Model Exams on Concept 3.2

Model Exam 1

Question 1

(A) Choose the correct answer:

1. Ancient people used .... as a form of fuel before discovering gasoline.
   a. oil b. coal c. charcoal d. wood
2. Fuel is used as a source of .... energy.
   a. thermal b. chemical c. light d. a and c
3. If we are going on a long trip in the car, we must check the ....
   a. seats b. airbag c. speedometer d. gasoline pointer
4. .... takes millions of years to be formed.
   a. Coal b. Charcoal c. Wood d. Corn

(B) Write the scientific term:

A device in the electric power station that changes the kinetic energy into electrical energy. (...............)

Question 2

(A) Put (✓) or (✗):

1. As the speed of the car increases, the amount of used fuel decreases. (   )
2. Fossil fuel are made from living things that can be planted. (   )
3. When the burning of fossil fuel increases, the temperature on Earth decreases. (   )
4. Using energy-saving light bulbs conserves electricity. (   )

(B) Cross out the odd word: Coal – Charcoal – Natural gas – Oil.

Question 3

(A) Choose from column (A) what suits it in column (B):

(A)	(B)
1 Liquid fuel	a. was used by ancient people. .
2 Gasoline	b. is made from grass, corn, and wood chips.
3 Charcoal	c. is a fuel that is made from oil.
4 Wood	d. is made from wood.

(B) Give a reason for:

Fossil fuel is considered a nonrenewable resource of energy.

Model Exam 2

Question 1

(A) Choose the correct answer:

1. All the following are found deeply under the Earth's surface, except ....
   a. coal b. oil c. natural gas d. green plants
2. .... is considered the main source of energy on the Earth's surface.
   a. Wind b. Fuel c. The Sun d. Water
3. One of the disadvantages of overusing biofuel is ....
   a. overfishing b. wildfire c. deforestation d. acid rain
4. Coal is formed underground due to the decomposition of dead ....
   a. plants b. animals c. humans d. birds

(B) Write the scientific term:

The energy resources that include all kinds of fossil fuel. (........)

Question 2

(A) Put (✓) or (✗):

1. All types of fuel are extracted from underground. ( )
2. When cooling water, it turns into steam in electric power stations. ( )
3. The amount of fossil fuel is limited on the Earth. ( )
4. Thermal energy is produced from burning a piece of wood. ( )

(B) Cross out the odd word: Sun - Wind - Water - Coal. (........)

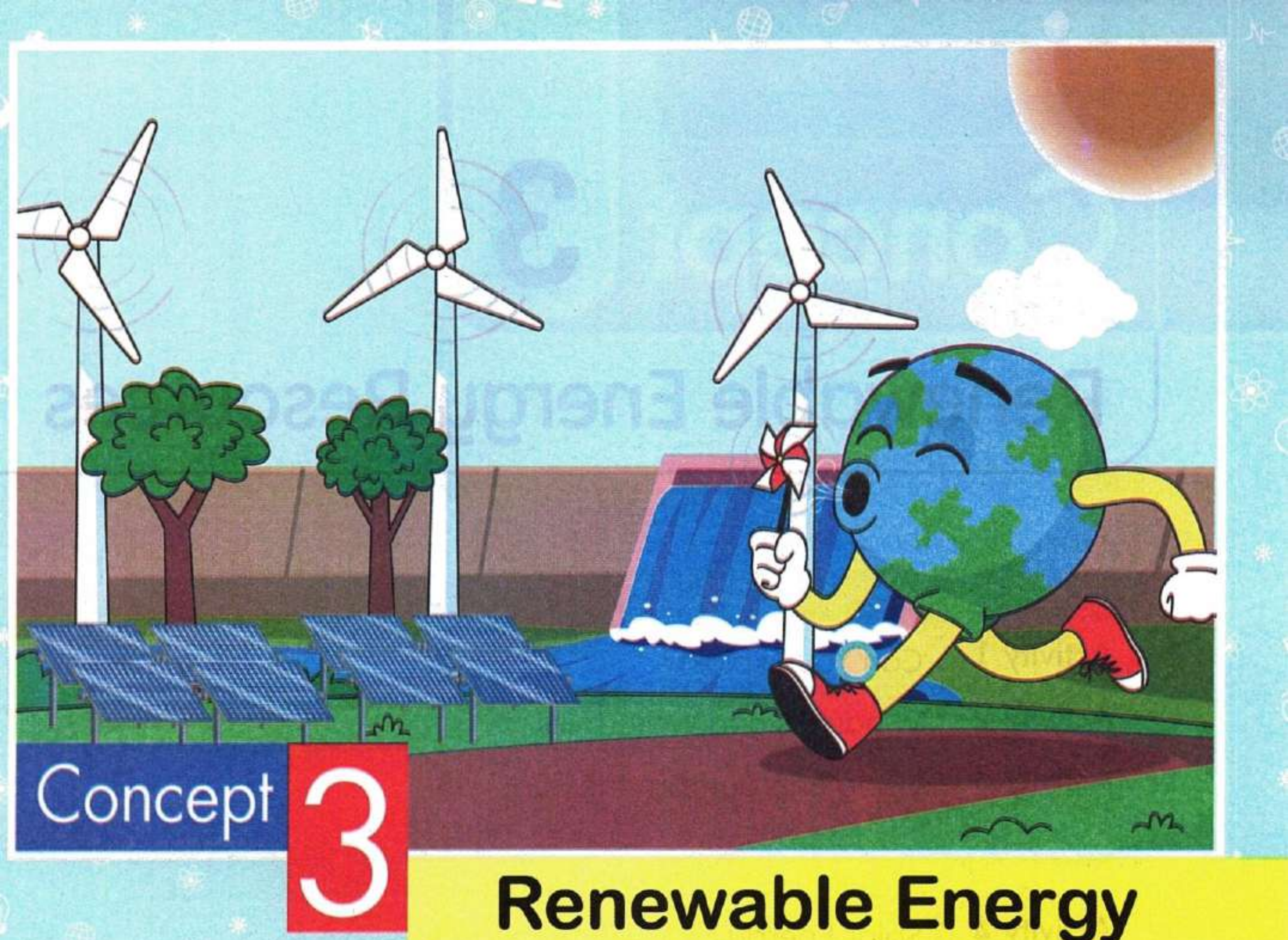
Question 3

(A) Arrange the following steps according to the formation of oil:

a (........) They fall to the bottom of oceans.
b (........) The organisms are exposed to high pressure and temperatures.
c (........) They are covered with rocks and sediments.
d (........) Some marine organisms died.
e (........) Over millions of years, these remains have been transformed into oil.

(B) What happens if?

The remains of dead plants are exposed to extreme heat and pressure for millions of years?



Concept 3 Renewable Energy Resources

Concept Objectives:

By the end of this concept:

- Students can apply scientific ideas to design, test, and refine devices that convert energy from one form to another.
- Students can explain the use of renewable resources in the generation of electricity.
- Students can develop models based on observations and evidence that energy is transferred from one place to another.

Key Vocabulary:

- Heat
- Light
- Radiation
- Solar energy
- Turbine
- Watermills
- Windmills

Concept 3

Renewable Energy Resources

Lesson 1	
Activity 1	Can You Explain?
Activity 2	Windmills and Watermills
Activity 3	Using Energy from the Sun

Lesson 2	
Activity 4	Solar Energy
Activity 5	Harness the Wind

Lesson 3	
Activity 6	Falling Water
Activity 7	Hands-on Investigation: Modeling a Turbine Generator

Lesson 4	
Activity 8	Record Evidence Like a Scientist: Windmills and Watermills



Activity 1 Can You Explain?

- In the previous concept, we have learned that:

Renewable resources of energy: They are natural resources that are replaced (renewed) in a faster rate than that of being consumed.

- We can generate electricity using different renewable energy resources.

Such as:



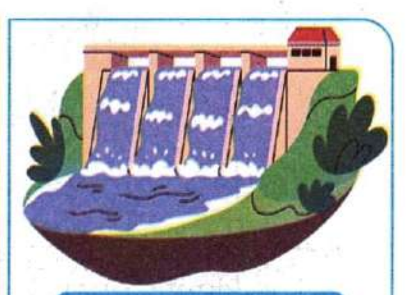
Solar Panels

Generate electricity to light streets using solar energy.



Wind Turbines

Generate electricity using the kinetic energy of wind.



Water Turbines

Generate electricity using the kinetic energy of water.

In this concept we will study:

- Renewable energy and its resources.
- Wind turbines and water turbines.
- The uses of solar energy.
- Generating electricity using the wind's movement.
- Generating electricity using the water's movement.





Unit 3

Activity 2 Windmills and Watermills

Imagine you were born 400 years ago.

- Life was hard, and people needed machines to make their lives easier.
- Windmills and watermills were used to crush graine to make flour.

Windmill	Watermill
	
Way of working	
1 The wind moves the mill's blades. 2 The kinetic energy transfers to the internal parts of the mill.	1 The water moves the mill's blades. 2 The kinetic energy transfers to the internal parts of the mill.
Importance	
• They are used to crush (grind) grains and make flour.	
Advantages	
• Low cost.	• Renewable energy resource.
Disadvantages	
• Sometimes the wind doesn't blow, so it can't do its main job.	• Sometimes, the water supply may dry up, so it can't do its main job.



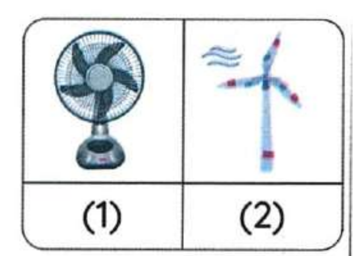

Machines	الآلات	Windmill	الطواحين الهوائية	Watermill	الطواحين المائية
Blades	شفرات	Internal Parts	الأجزاء الداخلية	Cost	تكلفة
Blow	تهب	Dry up	تجف		

Modern turbines are used now instead of old windmills.

① Modern Wind Turbines	② Old Windmill
	
Function	
• They are used to generate electricity.	• They are used to grind the grains to make flour.
Differences	
• They are taller than windmills. • They have fewer blades than windmills. • They have no opening in their blades.	• They are shorter than wind turbines. • They have more blades than wind turbines. • They have openings in their blades.
Similarity	
• They depend on the kinetic energy of wind to be operated.	

Check your understanding?

» Study the opposite figures, then complete:



1. Figure (......) uses electricity to make wind.
2. Figure (......) uses wind to make electricity.
3. The device in figure (......) is used to generate electricity that is used to operate the device in figure (......).

Modern turbines	التوربينات الحديثة	Old windmills	الطواحين القديمة
Function	الوظيفة	Openings	فتحات



Activity 3 Using Energy From the Sun

- The Sun is the **main source** of all kinds of energy on the Earth.
- The Sun provides us with **light** and **heat**.



Even at night, you feel the warmth of the Sun.

Because the atmosphere, water, and Earth's surface absorb the Sun's energy, causing a rise in the Earth's temperature.

Solar Energy

- Energy received from the Sun is called **solar energy**.
- We can use solar energy as a source of **thermal energy**.
- Sun rays are called **radiant energy (radiation)**.



- يُطلق على الطاقة الصادرة من الشمس الطاقة الشمسية.
- نستخدم الطاقة الشمسية كمصدر للحصول على الطاقة الحرارية.
- يُطلق على أشعة الشمس الإشعاع أو الطاقة الإشعاعية.

Uses of Solar Energy

1. Greenhouses
2. Warming
3. Cooking food
4. Heating water



1 Greenhouses:

Importance



- They help farmers plant the crops that only grow in warm climates.

How does it work?

1. A greenhouse allows the entry of light and radiant energy from the Sun.
2. Radiant energy changes into thermal energy inside it.
3. Thermal energy warms the greenhouse from inside.

• الأهمية:

تساعد المزارعين على زراعة المحاصيل التي لا تنمو إلا في المناخ الدافئ.

• كيفية عملها:

1 تسمح الصوبة الزراعية بمرور الضوء والطاقة الإشعاعية للشمس.

2 تتحوَّل الطاقة الإشعاعية إلى طاقة حرارية.

3 تقوم الطاقة الحرارية بتدفئة الصوبة الزراعية من الداخل.

2 Warming:

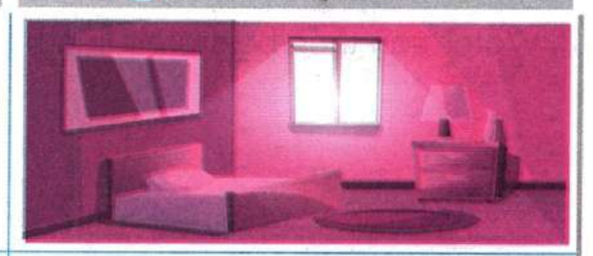
a Warming Ourselves



- Solar energy can be used directly as a source of thermal energy when exposing yourself to the Sun to feel warm.

• يمكن استخدام الطاقة الشمسية مباشرة كمصدر للطاقة الحرارية عند تعريض نفسك للشمس لتشعر بالدفء.

b Warming Houses



- Houses can be built in a way that enables the energy of the Sun to warm them by placing large windows on the wall that faces the Sun.

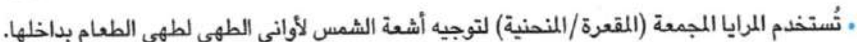
• يمكن بناء المنازل بطريقة تُمكّن طاقة الشمس من تدفئتها بوضع نوافذ كبيرة على الحوائط المواجهة للشمس.

3 Cooking Food:



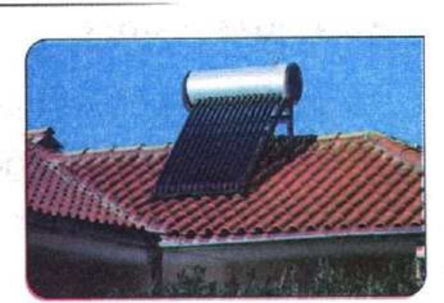
Convergent (concave/curved) mirrors:

- They collect and focus sunlight to heat a metal pot and cook the food inside.



• تُستخدم المرايا المجمعة (المقعرة/المنحنية) لتوجيه أشعة الشمس لأواني الطهي لطهي الطعام بداخلها.

4 Heating Water:



Solar water heater:

Structure:

- It contains panels made of black pipes.

Location:

- It can be placed on the roof of a house.

How does it work?

1. As water passes through the pipes, it heats up.
2. Water can then be stored in a hot water tank to be used later.

• التركيب: تتكوَّن من ألواح شمسية مصنوعة من أنابيب سوداء.

• الموقع: تُوضع على أسطح المنازل.

• كيفية عملها:

1 يتم تسخين الماء عندما يمر عبر تلك الأنابيب.

2 يتم تخزين الماء الساخن في خزان الماء الساخن للاستخدام في وقت لاحق.

Check your understanding?

» Put (✓) or (✗):

1. The output energy of a solar water heater is thermal energy. (   )
2. We feel the warmth of the Sun because it is visible all day. (   )

Exercises on Lesson 1

1 Choose the correct answer:

1. All the following are considered renewable resources of energy, except ....
   a. wind b. coal c. the Sun d. water
2. Which of these is an example of a renewable energy resource?
   a. Gold b. Petroleum c. Water d. Aluminium
3. The main function of .... is grinding the grains and making flour.
   a. modern turbines b. solar panels
   c. dams d. watermills
4. Both modern wind turbines and old windmills are similar in their............ .
   a. blades number b. ways of working
   c. height d. blades shape
5. One of the disadvantages of wind energy is that ....
   a. its cost is high b. it does not blow sometimes
   c. it can't be renewed d. it is limited
6. In wind turbines, the .... energy of the wind is changed into electrical energy.
   a. kinetic b. thermal c. sound d. light
7. Modern turbines are .... than old windmills.
   a. longer b. shorter c. heavier d. slower
8. The source of all energies on the Earth is/are ....
   a. planets b. the moon c. the Sun d. stars
9. Which of the following structures is used by humans to capture and use sunlight as an energy resource?
   a. Cranes b. Dams c. Solar cells d. Turbines
10. Using concave mirrors in cooking is one of the benefits of using ....
   a. wind b. water c. sand d. solar energy

11 The output of solar panels is .... energy.

a. solar b. electrical c. sound d. light

12 Solar energy is used in .... food.

a. cooling b. preserving c. cooking d. freezing

13 In winter, greenhouses help farmers grow plants that need ....

a. warm weather b. cold weather

c. less water d. less sunlight

2 Put (✓) or (✗):

1 Windmills can do their job all the time, as the wind never stops blowing. ( )

2 When the kinetic energy of the wind increases, the windmill blades spin faster. ( )

3 Both modern wind turbines and old windmills are used to generate electricity. ( )

4 Electricity generated by wind turbines is transmitted through the wind. ( )

5 The power source for the electric fan is wind. ( )

6 Turbines convert kinetic energy into electrical energy. ( )

7 Modern wind turbines are shorter than the old windmills. ( )

8 Greenhouses help farmers grow plants that need cold weather. ( )

9 We use solar energy to preserve food. ( )

10 We feel the warmth of the Sun during the day only. ( )

3 Write the scientific term:

1 The energy resources that include wind energy and water energy. (............)

2 The primary source of energy on Earth. (............)

3 They are used to collect and focus sunrays towards the cooking pots. (............)

4 A device that the wind rotates its blades for generating electricity. (............)

5 A device that consists of black pipes used to heat water. (............)

4 Complete the following sentences:

1. When the wind turbines rotate, ... energy is converted into .... energy.
2. Both wind and water movement produce .... energy, which is used to rotate turbines to generate .... energy.
3. Renewable energy resources include .... and ....
4. .... and .... are nonrenewable resources of energy.
5. Old windmills are .... than modern wind turbines.
6. The number of blades in modern wind turbines is .... than in old windmills.
7. We can use solar energy in cooking using concave ...., which collect and focus the .... onto the metal pots to heat them.
8. .... help farmers grow crops that need warm weather.

5 Give an example for each of the following:

1. A renewable resource of energy (....................)
2. A nonrenewable resource of energy (....................)

6 Compare between:

P.O.C	Old Windmills	Wind Turbines
Function	....	....
Number of Blades	....	....
Height	....	....

7 Choose from column (A) what suits it in column (B):

A

Column (A)	Column (B)
1 Wind turbines	a. were used to grind grains.
2 Solar panels	b. convert the kinetic energy of wind into electrical energy.
3 Old windmills	c. are used in heating water.

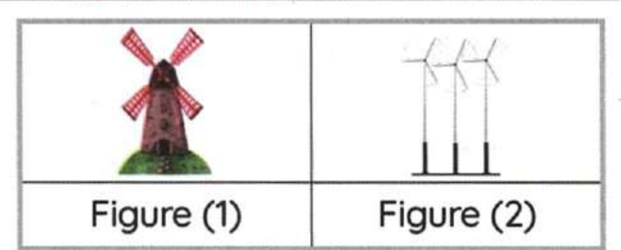
1 .... 2 .... 3 ....

B

Column (A)	Column (B)
1 Greenhouses	a. are used in heating water.
2 Concave mirrors	b. are used in planting some kinds of crops.
3 Panels of black pipes	c. are used in cooking food.

1 .... 2 .... 3 ....

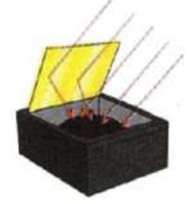
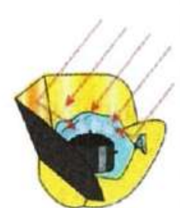
8 Study the following devices, then complete the sentences below:



1. Figure (........) is used to grind grains.
2. Machine in figure (........) is shorter than machine in figure (........).
3. Both of them are similar in ....
4. Both of them depend on ....

9 Study the following figures, then answer the questions below:

1. The opposite figure represents a solar oven:

a. What is the type of the mirror that is used in this device?

....

b. What is the importance of this device?

....

2 The opposite figure represents a panel of black pipes:

a. The input energy is ....

b. The output energy is ....

c. It is placed at ....

10 What happens if?

1 Wind moves the blades of windmills?

....

2 Wind doesn't blow in an area that contains wind turbines?

....

11 Give reasons for:

1 Solar energy is a renewable resource of energy.

....

2 People used windmills and watermills 400 years ago.

....

3 People now use modern wind turbines.

....

4 People depend on different machines in their lives.

....

5 You feel the warmth of the Sun at night.

....

6 Greenhouses are very important to farmers.

....

Lesson 2



Activity 4 Solar Energy

Put (✓) or (✗):

1. Energy received from the Sun is called solar energy. (   )
2. Even at night, we can feel the warmth of the Sun's energy. (   )

Solar Panels

Importance:

- Most solar panels are used to generate electricity.
- تُستخدم معظم الألواح الشمسية لتوليد الكهرباء.

Structure:

- It consists of a large number of small solar cells.
- تتكوَّن من العديد من الخلايا الشمسية الصغيرة.

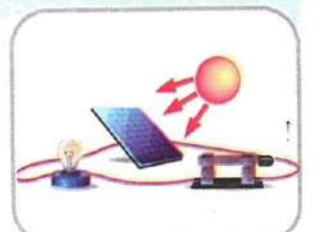
How do they work?

- Solar cells catch the radiant energy coming from the Sun and turn it directly into **electricity**.
- تلتقط الخلايا الشمسية الطاقة الإشعاعية للشمس وتُحوِّلها مباشرة إلى كهرباء.

Solar panels can be

Very Small

- To supply only one light bulb with energy.



Very Large

- To supply buildings or cities with energy.



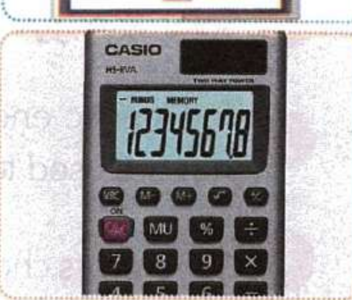
Uses of electricity generated by solar panels



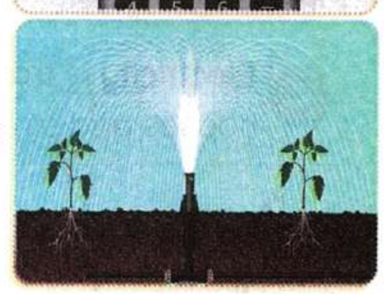
1. **It can be used directly to light streets.**



2. **It can be used to operate electric devices.**



3. **It can be used to recharge** some types of batteries, like solar-cell calculators.



4. **It can be used to power** irrigation equipment in some villages.

Check your understanding?

» Put (✓) or (✗):

1. The electrical energy is considered the input energy of solar panels. ( )
2. Some calculators run on batteries powered by small solar cells. ( )
3. Houses may use electricity produced from rooftop solar panels. ( )
4. Small panels can supply energy to whole buildings. ( )

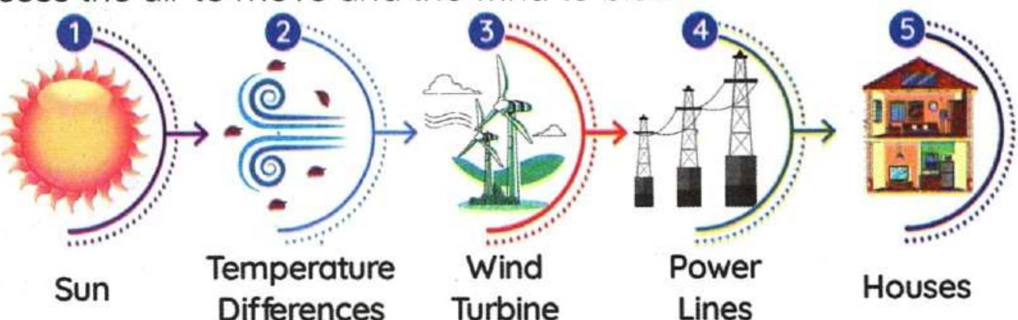




Unit 3

Activity 5 Harness the Wind

- As the Sun warms Earth, it warms the air.
- Different parts of the world get different amounts of solar energy which causes the air to move and the wind to blow.



1. **Solar energy** causes the air to move and the wind to blow.
   ↓
2. The kinetic energy of **wind** rotates the blades of **wind turbines** that are used to spin generators.
   ↓
3. **Generators** change kinetic energy into electrical energy.
   ↓
4. **Electricity** is transferred through big wires towards cities to light houses and streets.

1 تتسبَّب الطاقة الشمسية في حركة الهواء وهبوب الرياح.
2 تقوم الرياح بتدوير شفرات التوربينات الهوائية التي تقوم بدورها بتشغيل المولدات.
3 يقوم المولد بتحويل الطاقة الحركية إلى طاقة كهربية.
4 تنتقل الكهرباء عن طريق أسلاك ضخمة إلى المدن لإنارة المنازل والشوارع.



NOTE:
- When the kinetic energy of the wind increases, the blades rotate faster.

Check your understanding?

Put (✓) or (✗):

1. Kinetic energy of the wind can be used to generate electricity. (   )
2. Generators can be used to spin wind turbines. (   )

Exercises on Lesson 2

1 Choose the correct answer:

1. Solar panels can be used to operate all the following, except ....
   a. a calculator b. gas oven
   c. irrigation equipments d. street lights
2. The .... energy of the Sun causes air movements and wind blowing.
   a. chemical b. radiant c. electrical d. sound
3. The difference in temperature between cold and hot air causes ....
   a. rain b. a shadow c. wind blowing d. a rainbow
4. .... change the kinetic energy of turbines into electrical energy.
   a. Motors b. Panels c. Generators d. Fans
5. The correct arrangement for generating electricity from wind energy is: ....
   a. Sun – wind – power lines – wind turbines - houses
   b. Sun – wind – wind turbines – power lines - houses
   c. Sun – wind turbines – power lines – wind - houses
   d. Sun – wind turbines – wind – power lines - houses
6. Which statement is true?
   a. The wind rotates the blades of watermills.
   b. Electricity is transferred to cities through wind.
   c. Solar energy causes the wind to blow.
   d. Generators are used to spin turbines.
7. The electricity from wind turbines is transmitted into houses and factories through ....
   a. the wind b. solar panels c. generators d. wires

2 Put (✓) or (✗):

1. A solar cell consists of a large number of small solar panels. ( )
2. A calculator's output energy is solar energy. ( )

3. Solar cells are designed to capture the radiant energy of the Sun. ( )
4. Small solar panels may be able to light buildings. ( )
5. When the kinetic energy of the wind increases, the wind turbine blades spin more quickly. ( )
6. Generating electricity by wind turbines depends on the kinetic energy of water. ( )
7. Wind energy is a clean source of energy. ( )
8. Wind turbines are placed in windy areas. ( )

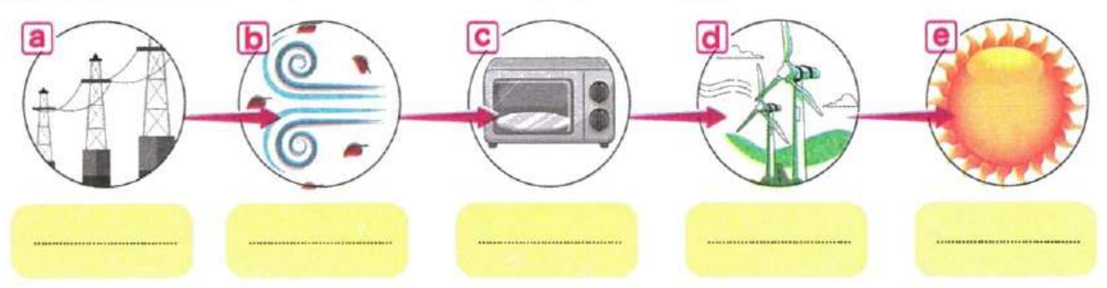
3 Write the scientific term:

1. A device that the wind rotates its blades for generating electricity. (..................)
2. It produces radiant energy that causes the wind to blow. (..................)
3. The device in an electric power station that turns kinetic energy into electrical energy. (..................)

4 Complete the following sentences:

1. The Sun .... the Earth and the air.
2. Solar energy causes the air to .... and the wind to ....
3. The generator converts .... energy into .... energy.
4. Electricity is transferred to cities through ....
5. It some villages, solar panels are used to generate .... energy that used to operate ....

5 To generate electricity, arrange the following figures from start to end:



....

6 What happens if?

1. The wind rotates the blades of the turbine?

....

....

2. The kinetic energy that is applied on the wind turbines increases?

....

....

7 Give reasons for:

1. The Sun helps in blowing the winds.

....

....

2. Generators have an important role in a power plant.

....

....



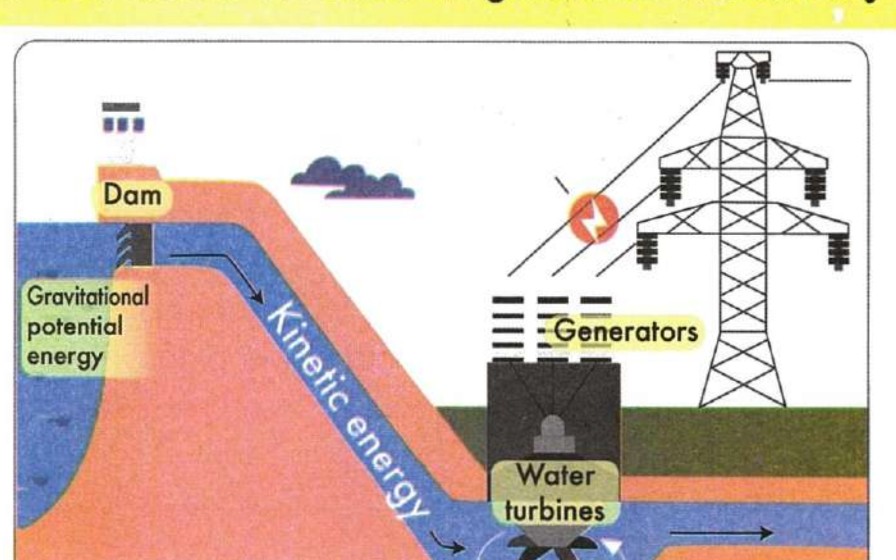
Activity 6 Falling Water

» As rivers run downhill, they change **gravitational potential energy** into **kinetic energy**.

GR Dams are built on rivers?

1. To control the flow of water.
2. To increase potential energy of water.

How can water be used to generate electricity?



1. A hydroelectric dam holds back the flow of water to increase its potential energy.

↓

2. When the water is released, it passes through the blades of turbines, so they rotate.

↓

3. Turbines operate generators, so kinetic energy is converted into electrical energy.

↓

4. Electricity is transferred to cities through long electric wires.

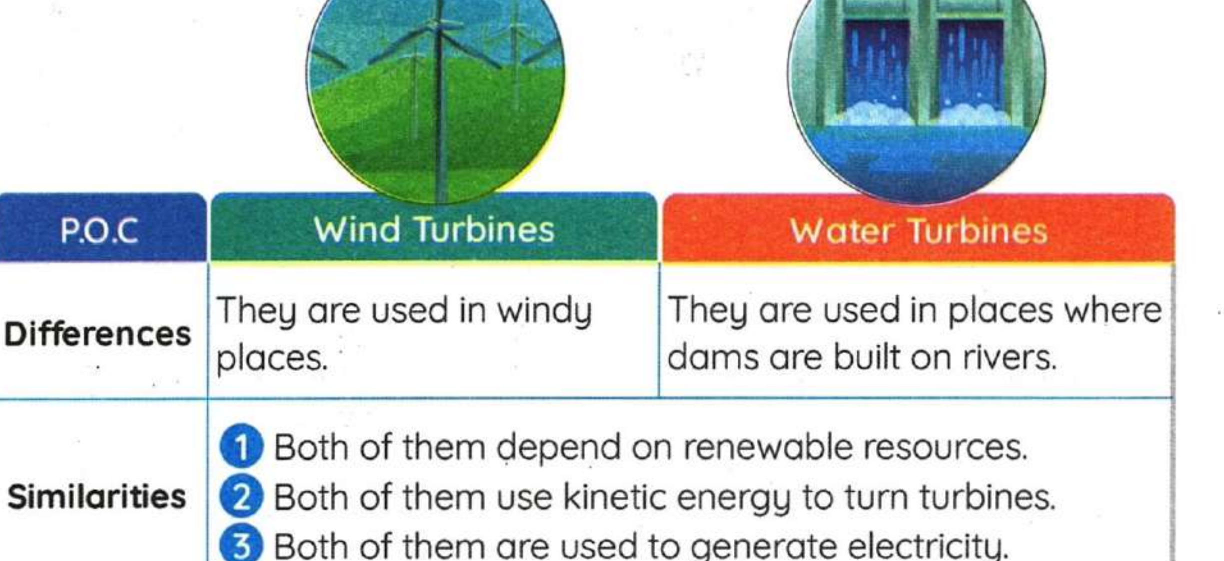
[1] يقوم السد بإيقاف سريان المياه؛ مما يؤدي لزيادة طاقة وضع المياه. [2] عند تحرير المياه، تسقط المياه على شفرات التوربينات؛ مما يؤدي لدورانها.
[3] تقوم التوربينات بتشغيل المولدات؛ فتتحوَّل الطاقة الحركية إلى طاقة كهربية. [4] تنتقل الكهرباء إلى المدن عبر أسلاك كهربية طويلة.

Hydroelectricity: (Hydroelectric energy)

- It is a type of electrical energy generated by water turbines in dams.

الطاقة الكهرومائية: هي نوع من الطاقة الكهربائية تُولِّدها التوربينات المائية في السدود.

The following table explains the similarities and differences between wind turbines and water turbines:



P.O.C	Wind Turbines	Water Turbines
Differences	They are used in windy places.	They are used in places where dams are built on rivers.
Similarities	1. Both of them depend on renewable resources. 2. Both of them use kinetic energy to turn turbines. 3. Both of them are used to generate electricity.	

Check your understanding?

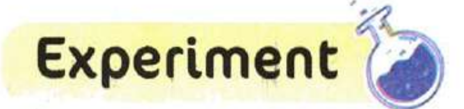
Put (✓) or (✗):

1. The electricity produced by water is known as electromagnetic energy. ( )
2. Dams are built in places with a strong wind. ( )
3. Wind turbines and water turbines are renewable energy resources. ( )
4. As the kinetic energy of the water increases, the blades rotate faster. ( )



Unit 3

» In this activity, we will design a model of a water turbine.



Tools:

Water bottle	Pinwheel	Plastic cup	Large bin

Steps:

1. Use the following materials to design a model of a water turbine.
2. Pour the water from the bottle onto the blades of the pinwheel.
3. When the water bottle runs out, use a plastic cup to refill it with the water in the jug to pour the water over the blades again.

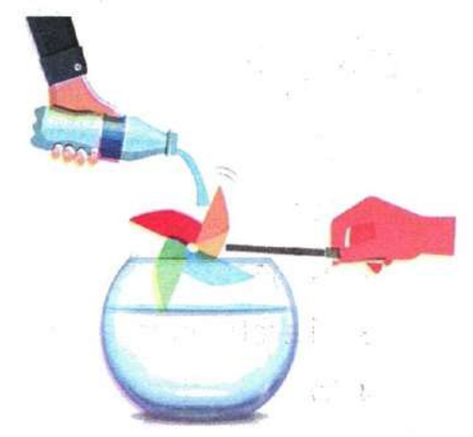
Observation:

» The blades rotate when water is poured over them.

» The blades stop when the water completely runs out.

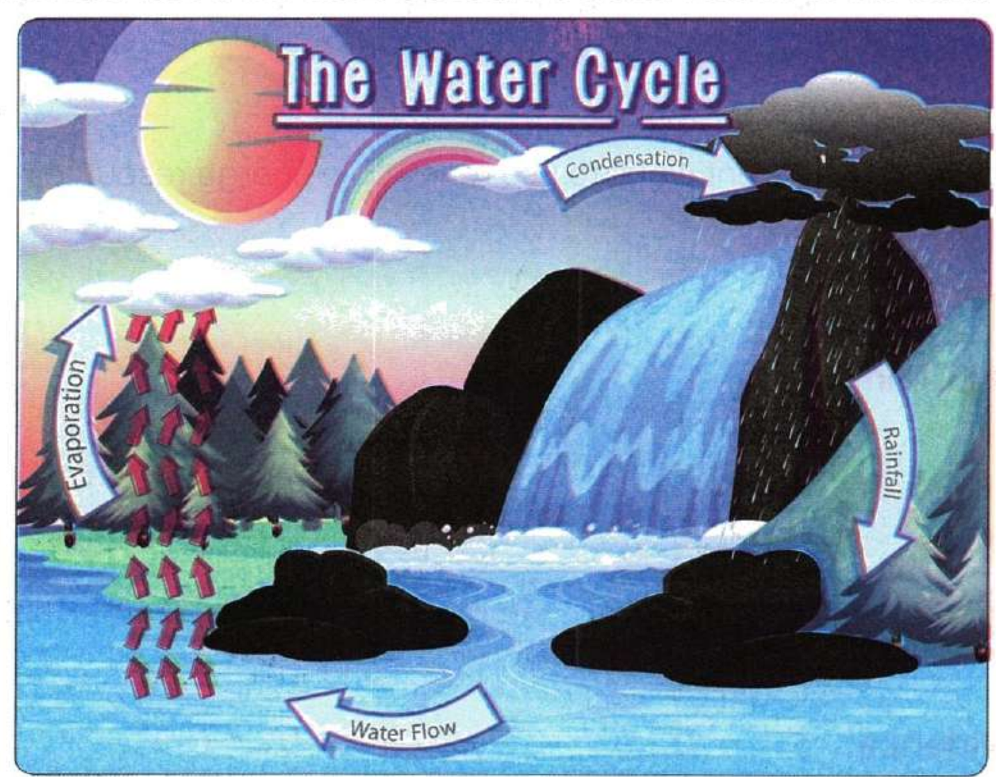
Conclusion:

» Moving water has **kinetic energy** that is used to run water turbines to generate **hydroelectricity**.



Water Cycle

- The river's water does not return to its source, but it flows into other bodies of water.
- Water **evaporates** and then **condenses** into clouds.
- When rain falls from these clouds, the water returns to the river.



- لا تعود مياه النهر إلى منبعها، ولكن يتدفَّق الماء إلى المسطحات المائية الأخرى.
- يتبخَّر الماء ويتكثَّف بعد ذلك في شكل سُحُب.
- عندما يسقط المطر من هذه السُّحُب يعود الماء مرة أخرى إلى النهر.

Check your understanding?

Put (✓) or (✗):

1. Water is a renewable resource of energy. ( )
2. In the water cycle, water condensates and then evaporates. ( )
3. The blades of water turbines rotate by kinetic energy of wind.( )
4. Wind turbines can be used to generate hydroelectricity. ( )

Lesson 4



Activity 8 Record Evidence Like a Scientist Windmills and Watermills

» In this concept, you have learned a lot about renewable and nonrenewable energy resources and the benefits of using renewable energy resources.

Question:

» What are the different ways to use renewable energy resources to generate electricity?

My Claim:

» ....

....

....

Evidence:

» ....

....

....

Scientific Explanation with Reasoning:

» ....

....

....

Exercises on Lessons 3 and 4

1 Choose the correct answer:

1. .... are used to increase the potential energy of water.
   a. Watermills b. Generators
   c. Dams d. Greenhouses
2. Hydroelectric power is produced using ....
   a. air b. water c. soil d. plants
3. Water of rivers stores great .... energy at the top of waterfalls.
   a. kinetic b. potential c. electrical d. light
4. When the water of rivers falls from a high slope, ...
   a. potential energy is converted into kinetic energy
   b. kinetic energy is converted into potential energy
   c. potential energy is converted into electrical energy
   d. kinetic energy is converted into electrical energy
5. The power source for the electric fan is ....
   a. wind b. water c. heat d. electricity
6. Without the ...., water of rivers can't be renewed.
   a. turbines b. Sun c. moon d. wind

2 Put (✓) or (✗):

1. When water becomes free, potential energy is changed into kinetic energy. (   )
2. The flow of water in dams can be controlled to generate electricity. (   )
3. Electricity generated from water is called hydroelectricity. (   )
4. Rivers store kinetic energy. (   )

5 The electricity produced by water is known as electromagnetic energy. ( )

6 When water falls down on waterfalls, its kinetic energy decreases. ( )

3 Write the scientific term:

1 The device in an electric power station that turns kinetic energy into electrical energy. (..........)

2 A structure on the river that controls the flow of water and increases the potential energy of water. (..........)

3 A type of electrical energy generated by water turbines in dams. (..........)

4 Complete the following using the words between the brackets:

(condenses - Wind turbines - evaporates - kinetic energy - water turbines - wires)

1 The input energy of a generator is ....

2 .... are placed in windy areas, where .... are found on rivers.

3 Electricity is transferred to cities through .... to light cities.

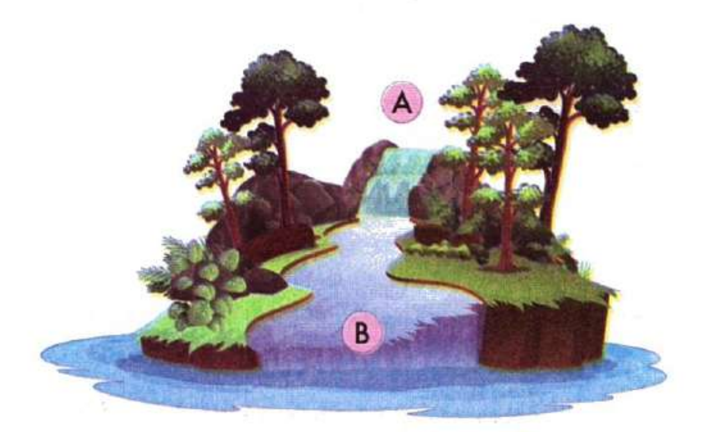
4 In water cycle, water .... by the heat of the Sun, then it .... before falling as rain.

5 Complete the following table:

P.O.C	Wind Turbines	Water Turbines
Location	....	....
Similarities	....	

6 Study the following figures, then answer the questions below:

1 The following figure represents a waterfall.



a. The potential energy is maximum at point ....

b. When the water falls, ... energy is converted into .... energy.

2 a. This figure represents ....

b. It controls the flow of water, when it increases the .... energy of water.

c. When water falls on turbines, they rotate to make .... run and generate ....



7 What happens if?

1 Dams hold back the flow of water?

....

2 The water of dams becomes free?

....

8 Give a reason for:

Dams are built on rivers.

....

Model Exams on Concept 3.3

Model Exam 1

Question 1

(A) Choose the correct answer:

1. All the following are considered renewable resources of energy, except ....
   a. wind   b. coal   c. the Sun   d. water
2. Modern turbines are .... than old windmills.
   a. longer   b. shorter   c. heavier   d. slower
3. The power source for the electric fan is ....
   a. wind   b. water   c. heat   d. electricity
4. Hydroelectric power is produced using ....
   a. air   b. water   c. soil   d. plants

(B) Write the scientific term:

A structure on the river that controls the flow of water and increases the potential energy of water. (........)

Question 2

(A) Put (✓) or (✗):

1. A solar cell consists of a large number of small solar panels. (   )
2. Both modern wind turbines and old windmills are used to generate electricity. (   )
3. When the kinetic energy of the wind increases, the windmill blades spin faster. (   )
4. Windmills can do their job all the time, as the wind never stops blowing. (   )

(B) Give a reason for: You feel the warmth of the Sun at night.

Question 3

The opposite figure represents a panel of black pipes:



1. The input energy is ....
2. The output energy is ....
3. It is placed at ....

Model Exam 2

Question 1

(A) Choose the correct answer:

1. Both modern wind turbines and old windmills are similar in their ....
   a. blades number b. height c. ways of working d. blades shape
2. The electricity from wind turbines is transmitted into houses and factories through ....
   a. the wind b. devices c. generators d. wires
3. The difference in temperature between cold and hot air causes ....
   a. rain b. a shadow c. wind blowing d. a rainbow
4. Dams control the water flow and increase its .... energy.
   a. potential b. electric c. magnetic d. thermal

(B) Write the scientific term:

A device that consists of black pipes used to heat water. (........)

Question 2

(A) Put (✓) or (✗):

1. The electricity produced by water is known as electromagnetic energy. ( )
2. Solar panels can be used in irrigation equipment. ( )
3. Sun is responsible for the water cycle. ( )
4. We use solar energy to preserve food. ( )

(B) What happens if?

Wind doesn't blow in an area that contains wind turbines?

Question 3

Choose from column (A) what suits it in column (B):

(A)	(B)
1 Greenhouses	a. are used in heating water.
2 Concave mirrors	b. are used in planting some kinds of crops.
3 Panels of black pipes	c. are used in cooking food.

Assess Your Learning on Unit 3

1 Choose the correct answer:

1. Energy doesn't destroy nor create from nothing; this indicates ....
   a. the draining of energy resources
   b. the conservation and transformation of energy
   c. resources of energy are numerous
   d. destroying the energy resources
2. The energy produced by radio that reflects its main function is ....
   a. electric energy
   b. sound energy
   c. light energy
   d. chemical energy
3. The design and work of the robot that explores the surface of Mars depend on the idea of transforming ....
   a. electric into kinetic energy
   b. potential into kinetic energy
   c. light into electric energy
   d. kinetic into electric energy
4. In our daily lives, we use devices that depend on energy. Which of the following uses is true?
   a. A computer depends on kinetic and electric energy.
   b. A ceiling fan depends on electric energy.
   c. The function of television depends on hydroelectric energy.
   d. Cell phones depend on potential and kinetic energy for operation.
5. Which of the following energy forms isn't produced from the Sun?
   a. Thermal energy
   b. Light energy
   c. Kinetic energy
   d. Radiation energy
6. Which of the following is a preferred natural resource to generate clean energy?
   a. Ocean and river water
   b. Trees and dry herbs
   c. Water, coal, and oil
   d. Wind, oil, and natural gas
7. .... are used in converting light energy to electric energy.
   a. Wind turbines b. Water turbines c. Solar panels d. Windmills
8. .... is a renewable source of energy.
   a. Coal b. Natural gases c. Water d. Fossil fuel
9. Energy produced from flowing water from waterfalls and dams and turbines is called .... energy.
   a. mechanical b. hydroelectric c. potential d. thermal

2 Rearrange the following steps to describe how coal is formed:

a (......) The Earth's surface plants get old and die.

b (......) The remains of the plants were decomposed and covered with sand and clay layers.

c (......) Anciently, Earth was containing with swamps where plants grew.

d (......) Several layers of clay and sand were deposited on the remains of died plants.

e (......) The buried plants were changed into coal due to the effects of heat and pressure.

3 Complete the following model:

.... used in → electric lamp produces → ....
→ ....

4 Complete the following model to describe the hydroelectric energy, then determine the inputs and outputs of this system.

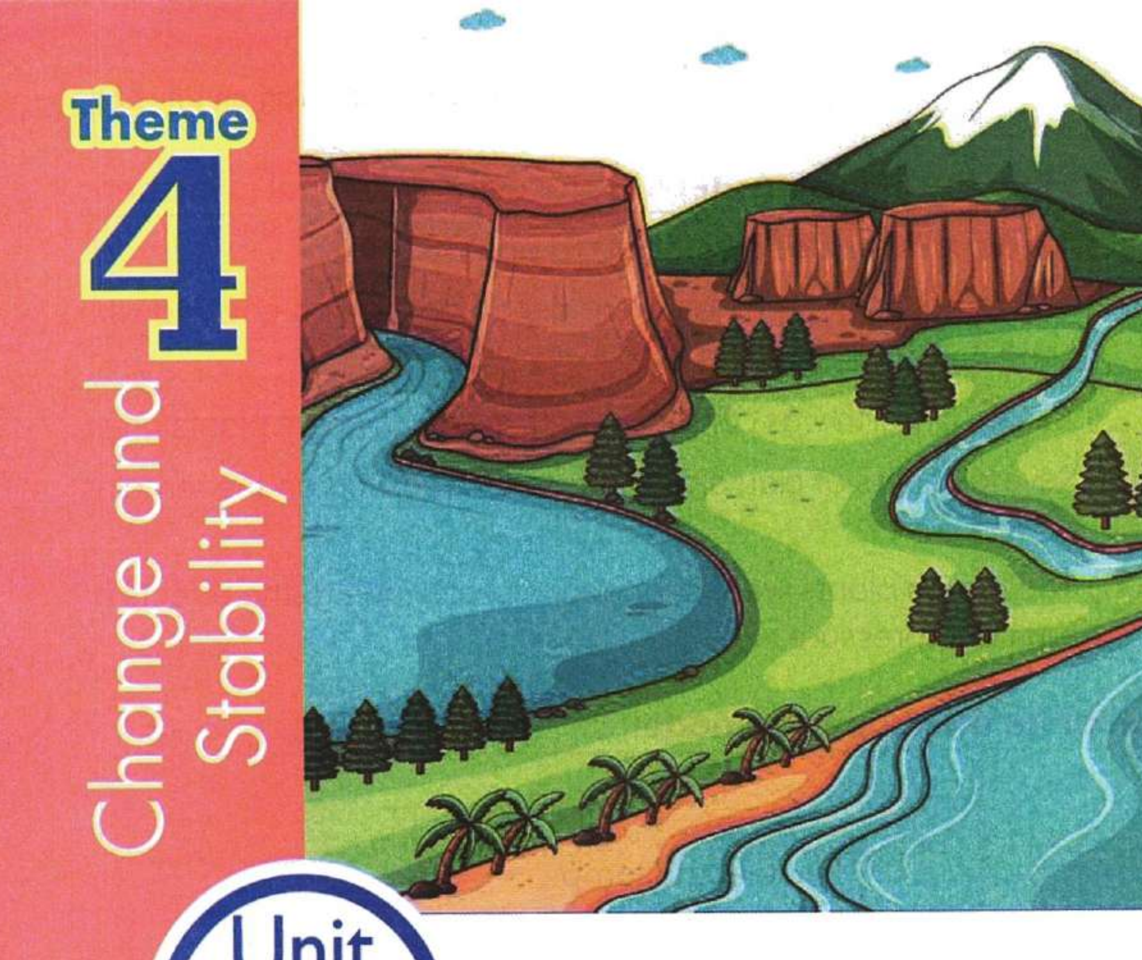
Potential energy of the waterfalls → .... → Kinetic energy → ....

- Inputs: ....

- Outputs: ....

Theme 4

Change and Stability



Unit 4 Shifting Surfaces

Unit Concepts:

Concept 1 Breaking Down and Moving Rocks

Concept 2 Changing Landscapes

Unit Project: Forces that Shape the Earth

Unit Objectives

In this unit, we will study:

1. Factors that shape the Earth's surface, such as weathering, erosion, and deposition that occur over time.
2. The role of wind and water in changing the Earth's features.

Get Started
What I Already Know



How the Earth's surface changes

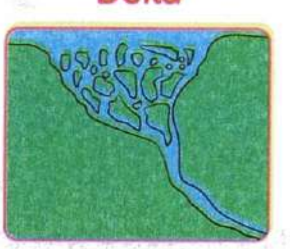


- The Earth's surface is always changing.

  Many factors can break down or change the Earth's surface, such as:



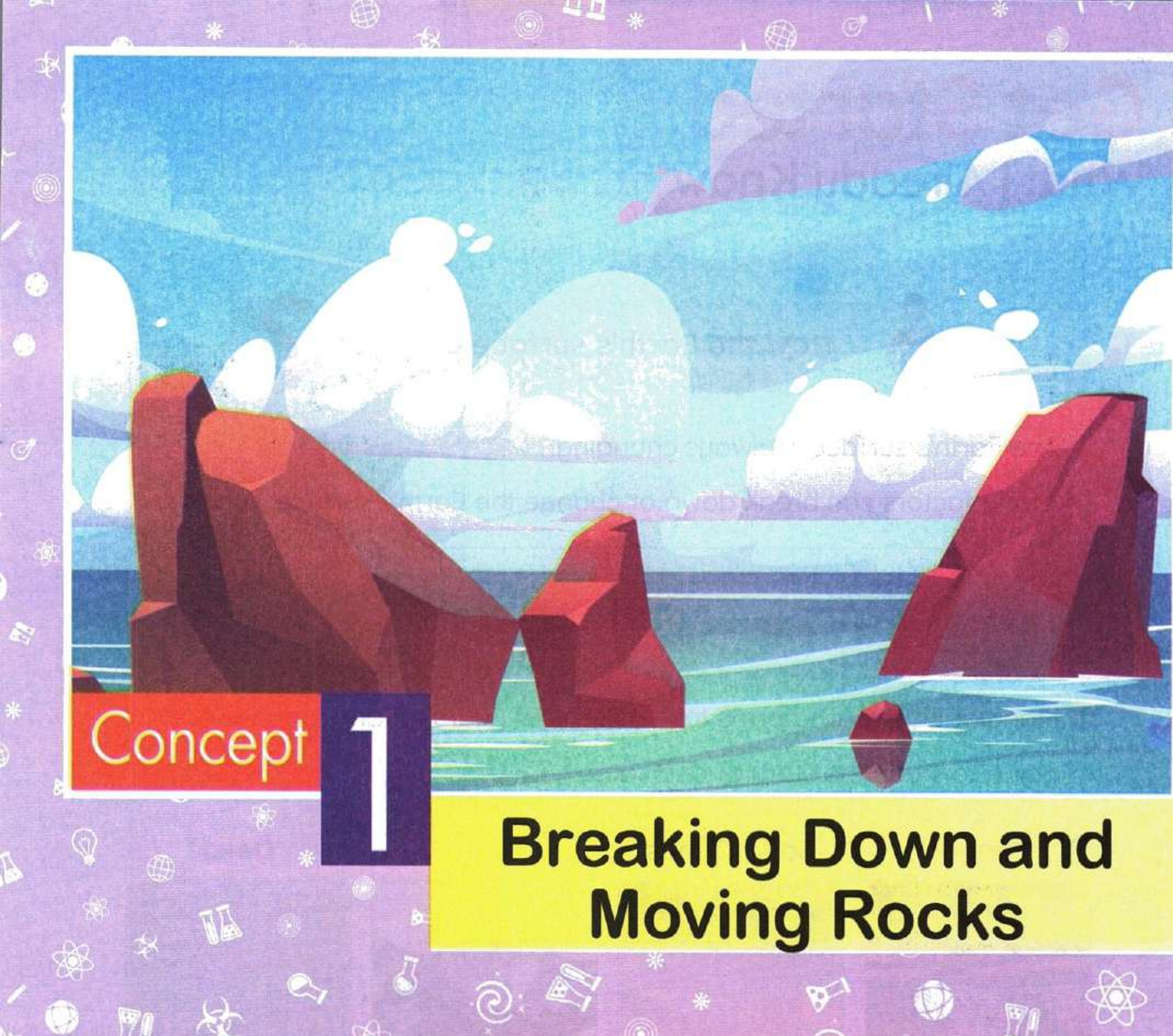
- Many of Earth's landforms take millions of years to form, and we are going to study the story of each one.

Canyon	Sand Dunes	Valley	Delta
			

Wadi Nakhr:

- The image shown is of a canyon called Wadi Nakhr in the country of Oman.
  Have you ever seen a canyon?
- In your opinion, what could cause the different landforms shown in the photo?
- The wavy cliff sides and high peaks are clues to help us understand how this canyon was formed.





Concept 1
Breaking Down and Moving Rocks

Concept Objectives:

By the end of this concept:

- Students can construct explanations based on observations of the roles water, wind, and heat play in weathering, erosion, and deposition.
- Students can make observations and collect data to provide evidence that mechanical and chemical weathering cause changes on Earth's surface over time, even in systems that appear to be stable.

Key Vocabulary

- Air
- Water
- Weathering
- Chemical weathering
- Mechanical weathering
- Deposition
- Erosion
- Heat
- Sediment
- Soil

Concept 1

Breaking Down and Moving Rocks

Lesson 1



Activity 1 Can You Explain?

» The Earth's surface is always changing due to the effects of wind, water, and weather changes.

• تتغيَّر مظاهر سطح الأرض باستمرار؛ بسبب العديد من العوامل مثل: الرياح، والماء، وعوامل الطقس.

For Example:

1. Wind can break down rocks and move small particles of rocks from one place to another.
   • يمكن للرياح أن تُفتِّت الصخور وتنقل جزيئات الصخور الصغيرة من مكان إلى آخر.



2. Water can break down rocks and change the shapes of rocks.
   • يمكن للمياه أن تُسبِّب تفتيت الصخور وتغيير شكلها.



Check your understanding?

» Correct the underlined words:

1. The Earth's surface is stable as time passes. (..............................)
2. Wind and water can change the moon's surface. (..............................)

» Give a reason for:

- The Earth's surface is always changing.

....



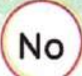


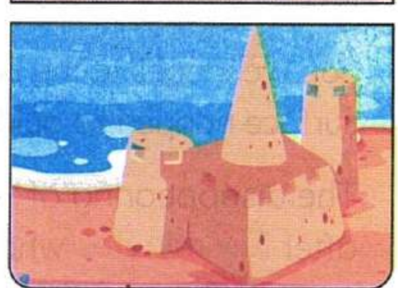
Activity 2 Disappearing Sandcastles



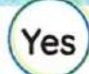
If you walked on the sand of the beach dunes, would your footprints remain the next day?

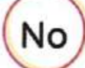






If you built a small sandcastle on the beach, do you think it would still be there the next day?

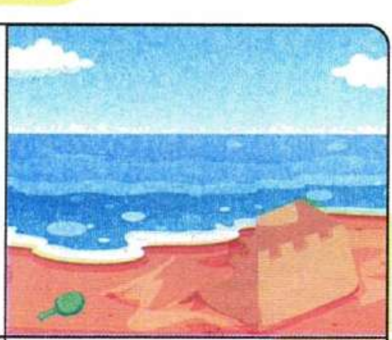




Examples of Erosion

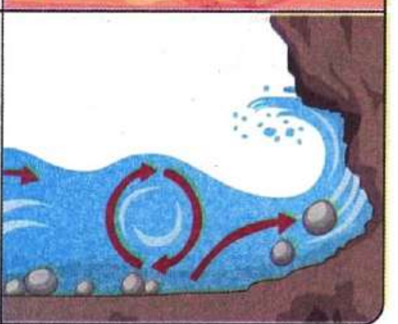
Sandcastles Erosion:

1. Water waves break sandcastles down after few hours.
2. Water waves can move sand particles to other places.



Beach Erosion:

- The movement of the waves causes erosion of the beach over time.



NOTES:

- Sand particles are formed from the breaking down of rocks.
- Wind and water can transport sand particles from one place to another.

• تتكوَّن جزيئات الرمل من تفتت الصخور. • يمكن للرياح والماء نقل جزيئات الرمل من مكان إلى آخر.

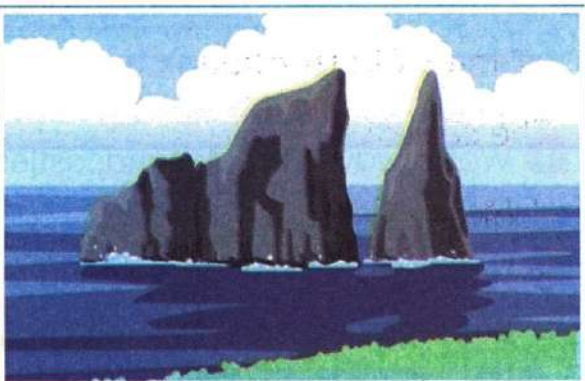



Unit 4

Activity 3 Sandcastles, Rocks, and Canyons

We have learned that wind, water, and weather changes can change the Earth's surface.

Earth's surface is changing by two ways:

Fast Changes	Slow Changes
• Some changes to the Earth's surface happen so quickly, such as:	• Some changes to the Earth's surface happen very slowly, such as:
• The disappearing of sandcastle after few minutes when water waves hit it.	• A little change may happen in the shape of coastal rock after many years because some parts of the rock break off.
	
• بعض التغيرات لسطح الأرض تحدث بصورة سريعة مثل اختفاء القلعة الرملية بعد دقائق من اصطدام الأمواج بها.	• بعض التغيرات لسطح الأرض تحدث بصورة بطيئة جدًّا مثل تغير بسيط في شكل الصخور الساحلية؛ بسبب تكسير بعض الأجزاء في الصخور.

Similarities between sandcastles and coastal rocks:

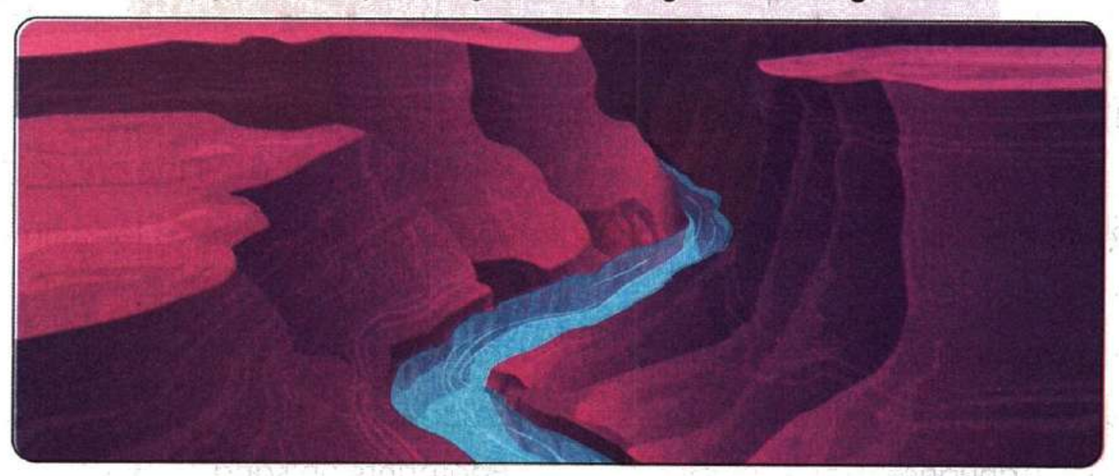
- Both have steep needle-like parts and sloping sides at the bottom.
- They are formed by the effect of water and wind.

أوجه التشابه بين القلاع الرملية والصخور الساحلية:

- يحتوي كلاهما على أجزاء حادة تشبه الإبر وجوانب مائلة في الأسفل.
- يتشكّلان بفعل الماء والرياح.

Canyons

They are deep valleys carved by the flowing water.



Shape:

- The canyon has steep needle-like parts and slopes at the sides

Time of Formation:

- The canyon takes many years to be formed.

Way of Formation:

- The canyon is formed by the effect of water.

- الشكل: يحتوي كلاهما على أجزاء حادة تشبه الإبر ومنحدرات على الجانبين.
- الوقت اللازم لتكوُّنه: يستغرق تكوين الأخدود العديد من السنين.
- طريقه تكوُّنه: يتشكل الأخدود بفعل المياه.

Check your understanding?

» Put (✓) or (✗):

1. Canyons have slopes at the bottom and steep needle-like parts. ( )
2. Sandcastle becomes less stable after collision with the water waves. ( )
3. The shape of the canyon was formed in a very short time. ( )
4. Canyons are carved by the flowing water. ( )

Exercises on Lesson 1

1 Choose the correct answer:

1. .... can change the features of the Earth's surface.
   a. Water b. Wind c. Weather d. All the previous
2. All the following are landscapes that have changed over a long time, except ....
   a. canyons b. sandcastles c. coastal rocks d. mountains
3. Which of the following shapes may disappear quickly?
   a. Canyons b. Footprints on sand
   c. Coastal rocks on the beach d. Mountains
4. Sandcastles may be wrecked by the force of ....
   a. water b. wind c. gravity d. a and b
5. Sandcastles will .... after one year.
   a. still the same b. become stronger
   c. disappear completely d. partially affected
6. Steep valleys formed due to flowing water erosion are called ....
   a. hills b. sand dunes c. canyons d. deltas
7. A canyon may take .... to be formed.
   a. minutes b. hours c. days d. years

2 Put (✓) or (✗):

1. If we walk along a sand dune, our footprints will remain there the next day. (   )
2. The formation of canyons is considered a rapid change of the Earth's surface. (   )
3. Strong winds can break rocks down and change different landscapes. (   )

4. Sandcastles and coastal rocks face the same effect after collision with waves. ( )
5. Coastal rocks have sloping sides at the bottom. ( )
6. The Earth's surface changes from time to time. ( )
7. All changes to the Earth's surface take hundreds of years. ( )
8. Canyons take millions of years to be formed. ( )
9. The Earth's surface never changes. ( )
10. Water and wind are natural factors that cause the change in the Earth's surface. ( )

3 Write the scientific term:

1. A natural factor by which canyons are curved. (..................)
2. They are deep valleys carved by the flowing water. (..................)

4 Correct the underlined words:

1. The Earth's surface is stable as time passes. (..................)
2. Gravity can change the shape of canyons. (..................)
3. The sandcastle becomes stronger after being hit by waves. (..................)
4. The shape of the canyon was formed in a very short time.(..................)

5 Complete the following using the words between the brackets:

(quickly – Coastal rocks – Wind – very slowly – steep – water – canyons – sandcastle)

1. The canyon has .... parts.
2. Sandcastles' shapes change ...., while canyons' shapes change ....
3. .... and .... can change the Earth's landscapes.
4. .... and .... have sloping sides at the bottom.

6 Choose from column (A) what suits it in column (B):

Column (A)	Column (B)
1 The sandcastle's shape	a. can be changed very slowly by the effects of water or wind.
2 The coastal rock's shape	b. can be changed quickly by the effects of wind or water.
	c. can be changed very slowly by the effect of water only.

1 .... 2 ....

7 Study the following figures, then complete the following sentences:

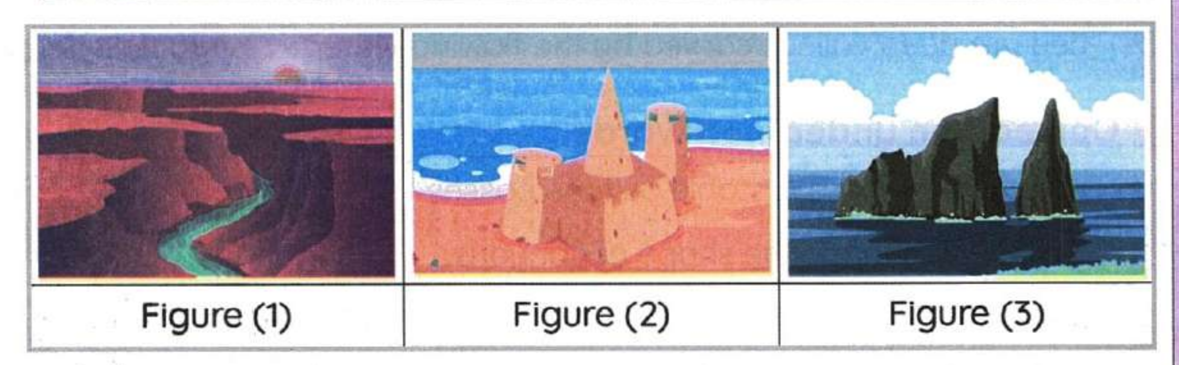


Figure (1) Figure (2) Figure (3)

1. Figure (..........) has steep parts and sloping sides.
2. Figures (..........) and (..........) are changed very slowly, while figure (..........) is changed very quickly.
3. After many hours, figure (..........) will disappear completely.

8 Give reasons for:

1. The Earth's surface is always changing.

....

....

2 Changes to the Earth's surface occur at different times.

....

....

3 The sandcastle completely disappears after a short time.

....

....

4 There may be a little difference in the shape of coastal rocks after a lot of years.

....

....

9 What happens if?

1 Waves of seawater hit your sandcastle?

....

....

2 A sandcastle and a coastal rock are left for an hour?

....

....

Lesson 2





Activity 4 What Do You Already Know About Breaking Down and Moving Rocks?

Shaping the Earth

» There are three main processes that may cause changes to the Earth's surface.

يوجد ثلاث عمليات رئيسية قد تتسبَّب في تغيير مظاهر سطح الأرض:

1 عملية التجوية: تكسير وتفتيت الصخور.

2 عملية التعرية: نقل فُتات الصخور أو التربة.

3 عملية الترسيب: إرساء الرواسب في الأسفل.



NOTE:

- Sediments could be sand, rock, or soil.



Activity 5 What Is Weathering?



» What is the weather outside today? Is it sunny or rainy, windy or icy?

- All these factors are part of the weather and are also involved in weathering.
- Weather and weathering are different where,





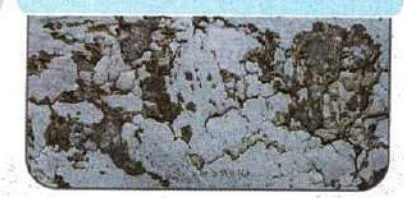
Weather	Weathering
• Is the condition of the atmosphere at specific place.	• Is the process of breaking down rocks into small (tiny) particles.
الطقس: هو حالة الجو في مكان معين.	التجوية: هي عملية تفتُّت الصخور إلى قِطَع صغيرة.

Weathering may cause

1. A breakdown (crumbling) of status.



2. Paint to peel on a building.



3. Waves to pull sand from the beach.



NOTES:

- Weathering breaks down big rocks into tiny rocks, then into pebbles or sand grains.
- Knowing the weather helps you decide what to wear when you go outside.

• تعمل التجوية على تفتيت الصخور الكبيرة إلى صخور صغيرة ثم إلى حصى أو حبيبات رمل.
• يساعدنا معرفة حالة الطقس على تقرير ما سنقوم بارتدائه خارجًا.

Check your understanding?

» Put (✓) or (✗):

1. Weathering can change the shape of landscapes over time. (   )
2. Weathering is the condition of the atmosphere in a specific place. (   )




Activity 6 Types of Weathering

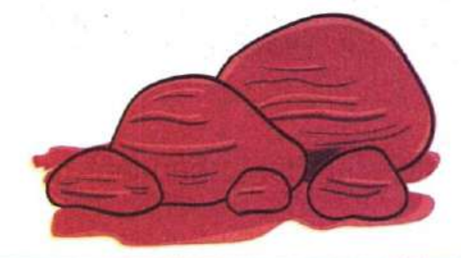
- Weathering is one of the factors that changes the Earth's surface.
- If you have seen rocks of different sizes, this is evidence of weathering.

Enormous rocks (that makes up mountains) → are broken down into → boulders → are broken down into → smaller rocks → are broken down into → sand

- تُعتبر التجوية من العمليات التي تُغيِّر سطح الأرض.
- إذا رأيت صخورًا ذات أحجام مختلفة؛ فهذا دليل على عملية التجوية.
- تتسبَّب التجوية في تكسُّر الصخور الكبيرة (المُكوِّنة للجبال) إلى صخور أصغر إلى أن تصبح رمالًا.

Types of Weathering

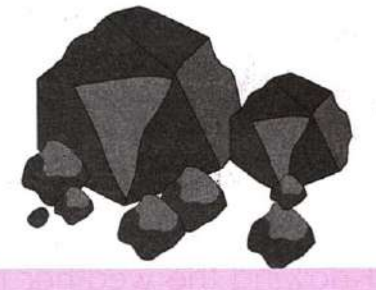
1 Chemical Weathering



The process of breaking rocks down with a change in their structure (nature) due to chemical reactions.

عملية تفتُّت الصخور مع تغيير تركيبها بسبب التفاعلات الكيميائية.

2 Mechanical Weathering



The process of breaking rocks down without a change in their structure (nature) due to physical factors.

عملية تفتُّت الصخور بدون تغيير تركيبها بسبب العوامل الفيزيائية.

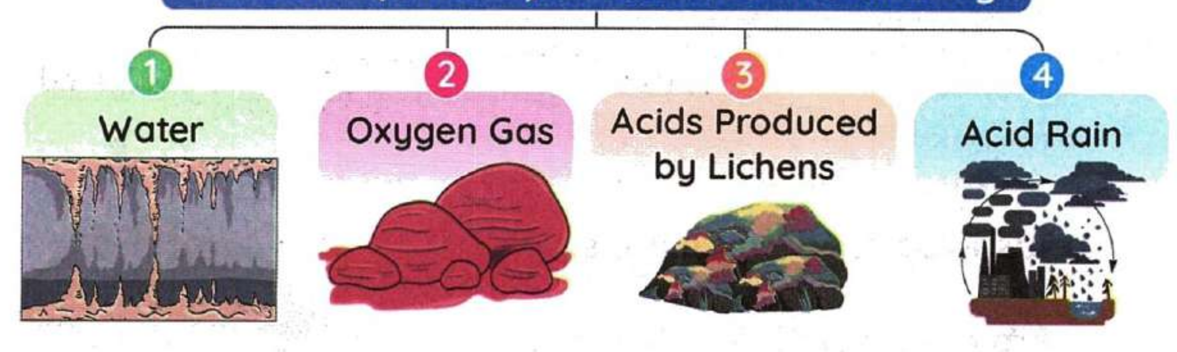
Concept 1

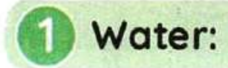
Chemical Weathering

It is the change in the structure of rocks due to chemical reactions.

التجوية الكيميائية: هي التغير الذي يحدث لتركيب الصخور بسبب التفاعلات الكيميائية.

Reasons (Factors) of Chemical Weathering





1 Water:

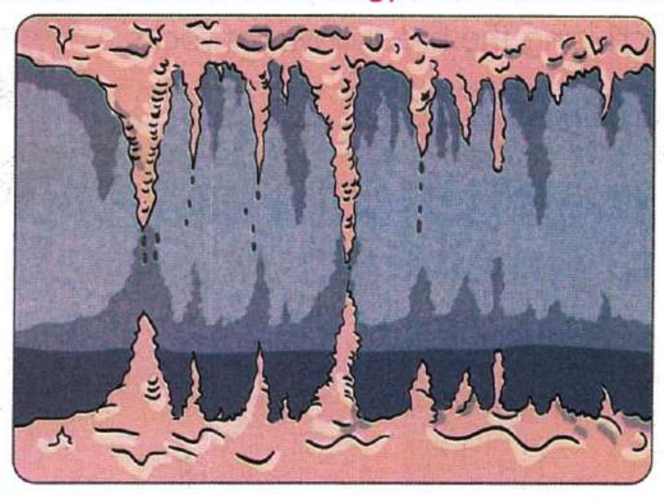
As water runs over rocks:

- It dissolves some minerals in rocks. This makes the rocks fall apart.
- Dissolved minerals combine again to form new shapes, as in a limestone cave.

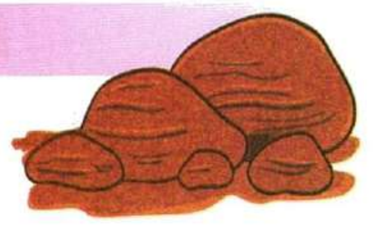
يتسبَّب جريان المياه على الصخور في:

- ذوبان بعض المعادن المُكوِّنة لهذه الصخور؛ مما يؤدي إلى تآكل هذه الصخور.
- قد تتحد أجزاء الصخور المذابة مع مواد أخرى؛ لتُكوِّن أشكالًا جديدة كما في الحجر الجيري الموجود في هذا الكهف.

» Most caves are formed due to this type of chemical weathering.



2 Oxygen Gas:



- Oxygen in the air reacts with iron in some rocks forming red-colored rust.
- This reaction also weakens rocks, causing them to break more easily.

- يتفاعل الأكسجين الموجود في الهواء مع الحديد المُكوِّن لبعض الصخور مُكوِّنًا صدأ أحمر اللون.
- يتسبَّب هذا التفاعل في إضعاف تماسك الصخور وتفتُّتها بسهولة.

3 Acids Produced by Lichens:

- Lichens are tiny plant-like organisms that produce acids on rocks as they grow.
- Over time, acids dissolve minerals found in these rocks, and break them down easily.

- الأشنات: هي كائنات دقيقة تشبه النباتات، تنتج أحماضًا على الصخور أثناء نموها.
- بمرور الوقت تعمل الأحماض على إذابة المعادن المكونة للصخور؛ مما يتسبَّب في تكسير الصخور.

4 Acid Rain:



- Acid rain can also dissolve minerals found in these rocks, causing the breakdown of rocks.

- يمكن للأمطار الحمضية أيضًا أن تُسبِّب إذابة المعادن المُكوِّنة للصخور؛ مما يتسبب في تكسير الصخور.

Mechanical Weathering

It is the breaking down of rocks due to the effect of physical factors.

التجوية الميكانيكية: هي عملية تفتت الصخور بسبب تأثير العوامل الفيزيائية.

Physical Factors: Reasons for Mechanical Weathering

1. Temperature
2. Wind and Sand
3. Flowing Water
4. Plant Roots



1 Temperature:

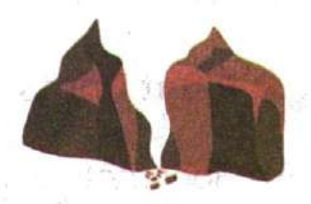
- Water and temperature often work together to break rocks.

1	2	3	4
Water flows into the tiny cracks in the rocks.	When the temperature is very cold, water **freezes** and expands, so the cracks become wider.	When temperature increases, ice **melts**, and water fills the newly formed cracks again.	The cycle of melting and freezing continues until rocks are broken down.









1. يتسلَّل الماء ويتغلغل داخل شقوق الصخور الدقيقة.
2. عند انخفاض درجة الحرارة يتجمَّد الماء ويتمدد داخل الشقوق؛ مما يتسبب في اتساع هذه الشقوق أكثر.
3. عند ارتفاع درجة الحرارة ينصهر الثلج وتملأ المياه الشقوق الجديدة التي تكوَّنت.
4. تستمر دورة الانصهار والتجمُّد إلى أن تنكسر الصخور.

2 Wind and Sand:

- Sand and wind team up to wear down large rocks.

1. Wind rushes sand on the rock surface.
2. Friction occurs between sand and rocks.
3. This causes the smoothing of rocks and breaks them down.



NOTE:

- Friction between sand and rocks is like the force of sandpaper on a piece of wood.

- تتسبَّب الرمال والرياح في تآكل الصخور الضخمة.

1 تقوم الرياح بدفع الرمال على أسطح الصخور. 2 تحدث قوة احتكاك بين الرمال والصخور.

3 تتسبب تلك القوة في صقل الصخور وتفتتها بعد ذلك.

- **ملحوظة:** قوة الاحتكاك بين الرمال والصخور مثل قوة استخدام ورق الصنفرة على قطعة الخشب.

3 Flowing Water:

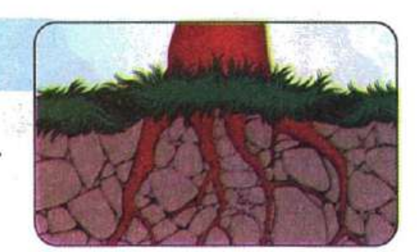


- Flowing water, full of small bits of floating gravel and sand, scours the rough edges of boulders.
- Rushing water causes rocks to tumble over one another, breaking off larger pieces when collisions occur.

المياه المندفعة «الجارية»:

- تمتلئ المياه الجارية بقِطَع صغيرة من الحصى والرمل المنجرف التي تصقل تلك القِطَع صغيرة الحواف الخشنة للصخور.
- تتسبب المياه المندفعة في تراكم الصخور واحدة فوق الأخرى؛ مما يتسبب في تكسُّر قِطَع الصخور الكبيرة عند ارتطامها معًا.

4 Plant Roots:



1. Plant roots grow inside the cracks of rocks.
2. Cracks become wider.
3. Rocks are broken down.

جذور الأشجار:

1 تنمو جذور النباتات في شقوق الصخور. 2 يتسبَّب ذلك في اتساع الشقوق. 3 تتفتَّت الصخور.



» We can see the effects of weathering all around us in the little rocks, pebbles, and sand that were parts of much larger structures.

Give a reason for...

- It is hard to see weathering in action.

Because weathering happens over long periods of time.

P.O.C	Chemical Weathering	Mechanical Weathering
Definition	The process of breaking rocks down with a change in their structure (nature) due to chemical reactions. • عملية تفتُّت الصخور مع تغيير تركيبها بسبب التفاعلات الكيميائية.	The process of breaking rocks down without a change in their structure (nature) due to physical factors. • عملية تفتُّت الصخور بدون تغيير تركيبها بسبب العوامل الفيزيائية.
Reason (Factors)	1 Water 2 Oxygen gas 3 Acids produced by lichens 4 Acid rain	1 Temperature 2 Wind and sand 3 Flowing water 4 Plant roots

Check your understanding?

» Classify these situations by writing the letters (M) for mechinacal weathering and (C) for chemical weathering:

1. Water freezes inside the cracks in rocks. ( )
2. Water dissolves minerals in limestone caves. ( )
3. Rushing water causes the smoothing of rocks. ( )
4. Plant roots grow into the cracks of rocks. ( )
5. Formation of red-colored rust. ( )

Exercises on Lesson 2

1 Choose the correct answer:

1. .... weathering is the change in structure of a rock.
   a. Physical b. Chemical c. Mechanical d. Electrical
2. The existence of rocks in different sizes is evidence of ....
   a. melting b. weathering c. erosion d. deposition
3. Weathering changes the mountains in the following order:
   a. Small rocks ⟶ boulders ⟶ then sand
   b. Sand ⟶ small rocks ⟶ boulders
   c. Boulders ⟶ small rocks ⟶ sand
   d. Sand ⟶ boulders ⟶ small rocks
4. Oxygen can rust ....
   a. a glass b. paper c. a rock d. plastic
5. Plant .... play an important role in the mechanical weathering process.
   a. leaves b. stems c. roots d. flowers
6. All of the following are reasons for chemical weathering, except ....
   a. water b. plant roots c. acid rain d. oxygen gas
7. .... may cause chemical or mechanical weathering.
   a. Lichens b. Oxygen c. Water d. Plant's roots
8. .... produce acids as they grow on rocks.
   a. Insects b. Plant roots c. Beetles d. Lichens
9. Which of the following examples represents mechanical weathering?
   a. Red-colored rust on rocks. b. Acid rain falls on rocks.
   c. Roots grow inside rocks. d. Water dissolves minerals.
10. .... and .... cause chemical weathering.
    a. Lichens – plant roots b. Acid rain – oxygen
    c. Melting – freezing d. Sand – wind

11 Sand is formed due to the breaking down of ....

a. glass b. plastic c. glass d. rocks

12 Limestone caves are formed due to the combination of ....

a. dissolved minerals b. insoluble minerals

c. red-colored rust d. acid rains

13 .... is the process in which sediments are carried to another place.

a. Deposition b. Erosion c. Weathering d. Melting

14 Dissolving minerals from rocks to recombine with new substances is an example of ....

a. mechanical weathering b. weathering by wind

c. chemical weathering c. erosion

15 All the following are processes that change the Earth's surface, except ....

a. erosion b. digestion c. weathering d. deposition

16 Lichens produce .... that dissolve(s) minerals found in rocks.

a. oxygen b. rains c. water d. acids

17 All of these are types of sediments, except ....

a. pebbles b. sand grains c. lichens d. rocks fragments

2 Put (✓) or (✗):

1 The deposition process takes place before the erosion process. ( )

2 We can see weathering in action everywhere around us. ( )

3 Weathering is the condition of the atmosphere in an area. ( )

4 Living organisms may cause mechanical and chemical weathering. ( )

5 Acid rain has the same effect on rocks as plant roots. ( )

6 Melting and freezing change the volume of water in a rock's cracks and make them wider. ( )

7. The broken down statues are evidence of the deposition process. ( )
8. Plant roots help in the formation of rocks. ( )
9. Rocks become stronger when iron found in them rusts. ( )
10. Wind is one of the agents that cause weathering. ( )
11. Weathering may occur due to collision (friction) between rocks and sand carried by wind. ( )

3 Correct the underlined words:

1. The shaping of the Earth's surface begins with erosion process. (..........)
2. When oxygen reacts with the iron in rocks, a green-colored rust is formed. (..........)
3. Stems of plants grow inside cracks of rocks, causing them to break down. (..........)
4. Carbon dioxide in the air always causes rust on rocks. (..........)
5. Limestone caves were formed due to mechanical weathering. (..........)
6. As plant roots grow inside rocks, the cracks become narrower. (..........)
7. The origin of sand is the breaking down of glass. (..........)

4 Complete the following using the words between the brackets:

(Mechanical - Acid rain - chemical - oxygen - Acids - iron - plant roots)

1. The melting and freezing cycle has the same effect as ...., as they make the cracks in rock become wider.
2. .... produced by lichens may dissolve rocks.
3. .... has the same effect of lichens on rocks.
4. .... weathering and .... weathering are types of weathering.
5. When the .... in air reacts with .... in rocks, a red-colored rust is formed.

5 Write the scientific term:

1. The process of moving rocks from one place to another. (..................)
2. The process of breaking boulders down into smaller rock particles. (..................)
3. The process of laying sediments down. (..................)
4. The kind of weathering that takes place by the effect water and temperature. (..................)
5. The kind of weathering that changes the structure and color of rock. (..................)
6. They are tiny, like plants, that live on rocks and produce acid on them. (..................)
7. The gas that causes the red-colored rust on some rocks. (..................)
8. A part of the plant that breaks down rocks as they grow through them. (..................)
9. A type of caves formed due to combination of dissolved minerals of rocks. (..................)
10. A mineral in rocks that reacts with oxygen forming red-colored rust. (..................)

6 Choose from column (A) what suits it in column (B):

Column (A)	Column (B)
1 Lichens	a. causes mechanical weathering for rocks.
2 Water	b. causes the red-colored rust on a toy car.
3 Oxygen	c. produce acids as they grow.
4 Melting and freezing	d. may cause both types of weathering.

1 .... 2 .... 3 .... 4 ....

7 Arrange the following steps:

a ( ) Ice melts, and water fills the newly formed cracks.
b ( ) Water freezes, expands, and widens the cracks.
c ( ) The melting and freezing cycle continues.
d ( ) Water finds its way into rock cracks.

8 Classify these situations by writing letters (M) for mechanical weathering and (C) for chemical weathering:

1. Plant roots grow into the cracks of rocks. (..........)
2. Iron rust formed on a toy car. (..........)
3. Water freezes inside the cracks of rocks. (..........)
4. Water dissolves the minerals in the limestone cave. (..........)
5. Acid rain falls and breaks down the rocks. (..........)
6. Oxygen reacts with iron in rocks, which weakens iron-rich rocks. (..........)
7. Wind rushes sand onto the rock surface. (..........)
8. Acids from lichens eat away the rocks where they grow. (..........)

9 Study the following figures, then complete the following sentences:

Figure (1)	Figure (2)	Figure (3)	Figure (4)

1. Figure (..........) represents a living organism that causes mechanical weathering.
2. Figure (..........) represents a living organism that causes chemical weathering.
3. Oxygen gas has a bad effect on rocks in figure (..........).

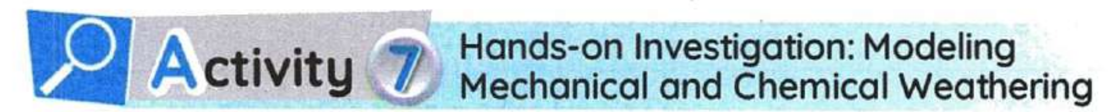
10 Give reasons for:

1. Knowing the weather conditions is very important.
2. Weathering may appear on statues and buildings.
3. The rocks around us exist in different sizes.
4. Rust appears on some old toy cars.
5. Oxygen in the atmosphere has a bad effect on some rocks.
6. Lichens break down rocks as they grow.
7. Sometimes, sand has the same force as sandpaper on a piece of wood.
8. Plant roots are considered a physical factor of mechanical weathering.

11 What happens if?

1. A metal toy is left outside and exposed to air and rain?
2. Flowing water with gravel and sand collides with boulders?
3. Oxygen gas reacts with iron rocks forming a red-colored rust?
4. Acid rain falls on rocks?
5. Water runs through limestone caves?
6. Lichens grow on rocks produce acid?
7. Plant roots grow inside rocks?

Lesson 3



Activity 7 Hands-on Investigation: Modeling Mechanical and Chemical Weathering

Experiment

» In this activity, students will investigate the similarities and differences between mechanical and chemical weathering.

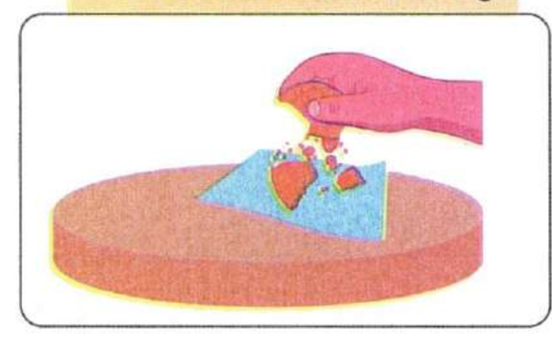
• في هذا النشاط، سيقوم الطلاب بالتحقيق في أوجه التشابه والاختلاف بين التجوية الميكانيكية والكيميائية.

Tools:

Two pieces of biscuits	Napkin	A cup of water	Antacid tablets

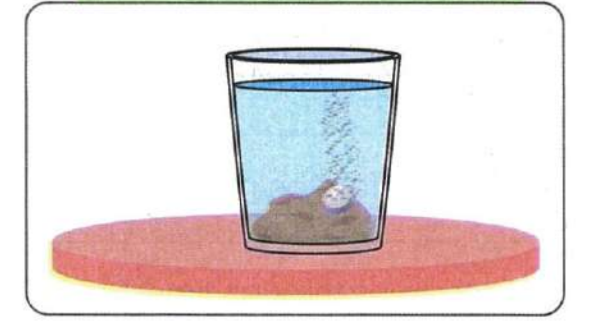
Steps:

a A model of mechanical weathering



1 Crush a piece of biscuit with your hand on the napkin.

b A model of chemical weathering



2 Place a piece of biscuit in the cup, then add water and antacid tablets to it.

Observation:

» **In the model of mechanical weathering,**
the biscuit is broken into small pieces, but it is still the same material.

» **In the model of chemical weathering,**
a completely different new substance "dough" is formed.

Conclusion:

» Mechanical weathering breaks down rocks into smaller pieces without changing their structure.

» Chemical weathering breaks down rocks into smaller pieces, and changing their structure.

Give a reason for...



- **Chemical weathering causes greater changes to substances than mechanical weathering.**

Because chemical weathering causes a completely new different matter, while mechanical weathering breaks the matter down into small pieces without changing it.

Check your understanding?

» Put (✓) or (✗):

1. Scientists use models of weathering because it is hard to see weathering in action. ( )
2. The weathering process usually takes a few days to happen. ( )
3. Mechanical weathering always produces a new substance. ( )
4. Water may cause mechanical weathering or chemical weathering. ( )

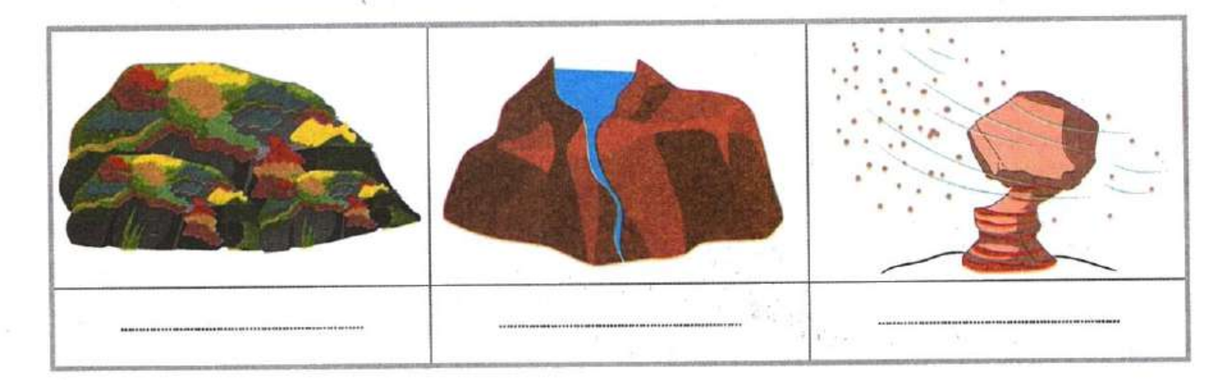


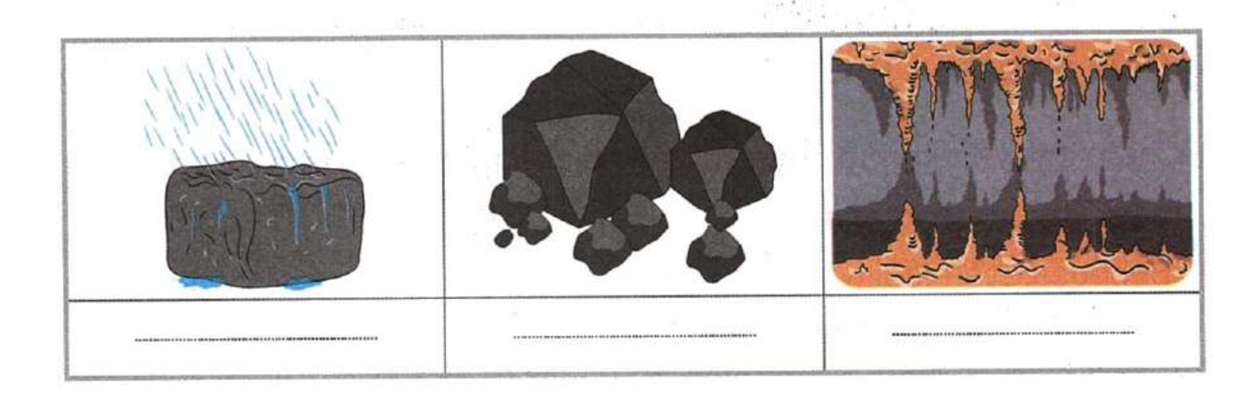


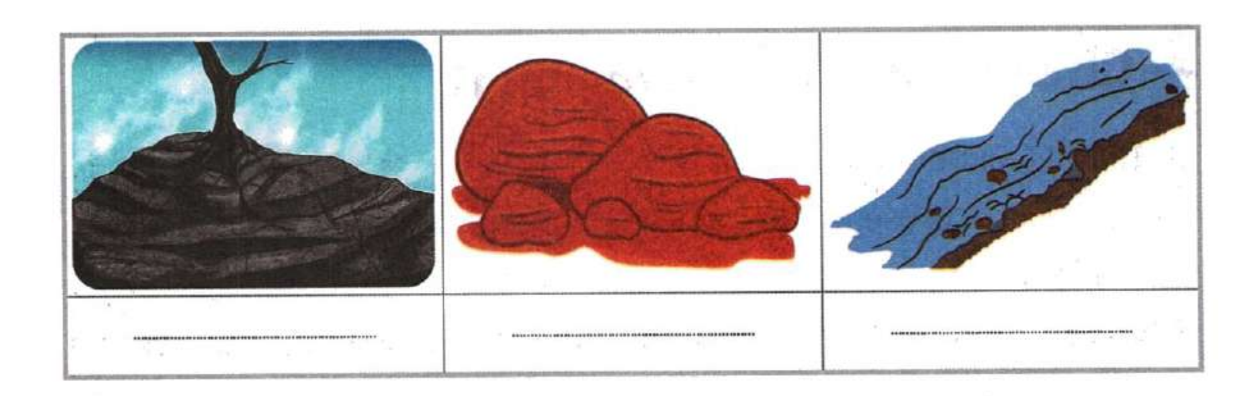
Activity 8 Weathering

Unit 4

» Study the following figures, then classify them by writing letters (M) for mechanical weathering and (C) for chemical weathering:







Exercises on Lesson 3

1 Choose the correct answer:

1. Crushing a piece of ice into small pieces is considered a model of .... weathering.
   a. biological b. chemical c. mechanical d. electrical
2. .... is a model of chemical weathering.
   a. Cutting vegetables to make salad
   b. Adding antiacid tablet and water to a biscuit
   c. Breaking down a glass by a hammer
   d. Dividing a loaf of bread by a knife
3. All the following are properties of chemical weathering, except that ....
   a. it changes the material of rocks completely
   b. it keeps the material of rocks
   c. it may dissolve rocks completely
   d. it produces greater changes to the rocks
4. Which of the following changes the matter of rocks?
   a. Roots grow in rocks.
   b. Lichens produce acid on rocks.
   c. Strong wind d. Heavy rain
5. The process of breaking down rocks on the Earth's surface is called ....
   a. erosion b. weathering c. decomposition d. deposition
6. When acid rain falls on a building, all the following may occur, except ....
   a. chemical weathering b. a change in the paint color
   c. a change in its rocks structure d. mechanical weathering

7. Which process describes water getting into cracks, freezing, and breaking the rocks or apart?

a. Erosion
b. Chemical weathering
c. Mechanical weathering
d. Deposition

2 Put (✓) or (✗):

1. Chemical weathering causes greater changes than mechanical weathering. ( )
2. Putting some nuts in a mixer is a model of chemical weathering. ( )
3. Both mechanical and chemical weathering processes break down the rocks into smaller pieces. ( )
4. Putting biscuits in water and adding an antacid tablet resembles the effect of chemical weathering. ( )
5. If a rock undergoes chemical weathering, its size and structure stay the same. ( )
6. Chemical weathering changes the composition of the rocks. ( )

3 Correct the underlined words:

1. When a metal statue slowly turns green, is considered mechanical weathering. (..................)
2. Weathering takes a short time in the real world. (..................)
3. Dividing a bar of chocolate into smaller pieces is a model of chemical weathering. (..................)
4. Growing roots inside a rock, causing chemical weathering. (..................)

4 Complete the following using the words between the brackets:

(breaks down - mechanical - matter - Chemical - long - short)

1. .... weathering changes the matter greater than .... weathering.
2. Chemical weathering always changes the .... of rocks.

3 Mechanical weathering always .... rocks without changing its matter.

4 Weathering always takes a .... time, but we can see its effects on rocks.

5 Write the scientific term:

1 It is a type of weathering that occurs in rocks and leads to the formation of a completely different material. (....................)

2 It is a type of weathering that breaks rocks down without changing their matter. (....................)

6 Give reasons for:

1 Crushing a biscuit into small pieces is a model of mechanical weathering.

....

2 Putting biscuits in water and adding an antacid tablet to it is a model of chemical weathering.

....

3 Chemical weathering causes greater changes to the rocks.

....

7 What happens if?

1 We crush a biscuit into small pieces?

(Concerning the type of weathering and resulted material).

....

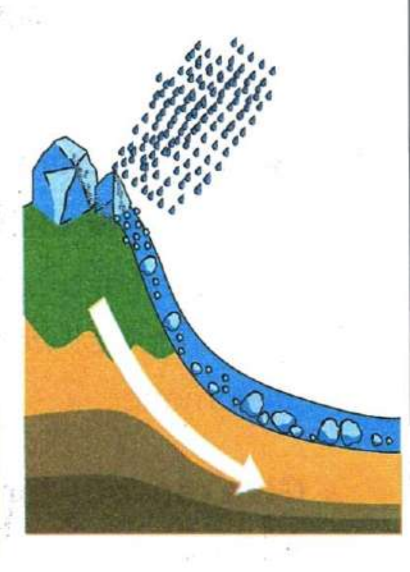
2 We submerge some biscuits in hot tea?

(Concerning the type of weathering and resulted material).

....

Lesson 4



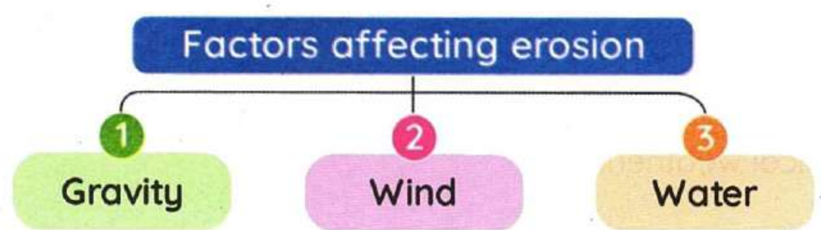


» When rocks are weathered, they are broken down into smaller pieces, so these small pieces are ready for erosion.

Erosion

It is the process of moving small particles of sand, soil, or rocks from one place to another.

عملية التعرية: هي العملية التي تحدث عند انتقال الجسيمات الصغيرة من الرمال أو الصخور أو التربة من مكان إلى آخر.



1 Erosion by Gravity:

- Gravity pulls broken rocks down a mountainside.

• تسحب الجاذبية الأرضية الصخور من جوانب الجبال إلى أسفل.

2 Erosion by Wind:

- The wind carries grains of sand from one place to another.
- A gentle wind moves grains of sand for a short distance (about meter).
- Stronger wind will blow more sand for a longer distance.

• تحمل الرياح حبات الرمال من مكان لآخر.
• تُحرِّك الرياح الخفيفة الرمال لمسافة قصيرة قد تكون مترًا واحدًا.
• تدفع الرياح الأقوى قدرًا أكبر من الرمال وتنقلها إلى مكان أبعد.



3 Erosion by Water:

Rivers and floods erode rocks and soil from their banks and carry them downstream.

• تعمل الأنهار على تعرية الصخور والتربة على ضفافها وتحملها في اتجاه جريان النهر.



Sea waves pull sand away from beaches.

• تقوم الأمواج بسحب الرمال من الشواطئ.



Rain washes the soil on farms that are located beside downhills.

• تجرف مياه الأمطار التربة الزراعية القريبة من المنحدرات الجبلية.



» Sometimes you can see erosion happening, such as:

1. During flash floods, hurricanes, or landslides.
2. You may see sediments carried down gutters by water runoff after a big rainstorm.
3. The water in a nearby creek appears muddy.

قد نشاهد عملية التعرية أحيانًا من خلال:

1 الفيضانات المفاجئة أو الأعاصير أو الانهيارات الأرضية. 2 انتقال الرواسب بفعل جريان المياه بعد عاصفة قوية ممطرة.
3 تحوُّل المياه إلى مظهر طيني أحيانًا في جدول (ممر مائي) قريب.

Sediments: They are pieces of weathered rocks that are moved by gravity, wind, and water.

الرواسب: هي قِطَع الصخور التي تفتَّتت بسبب التجوية، ثم تحرَّكت من مكانها بفعل الجاذبية والمياه والرياح.

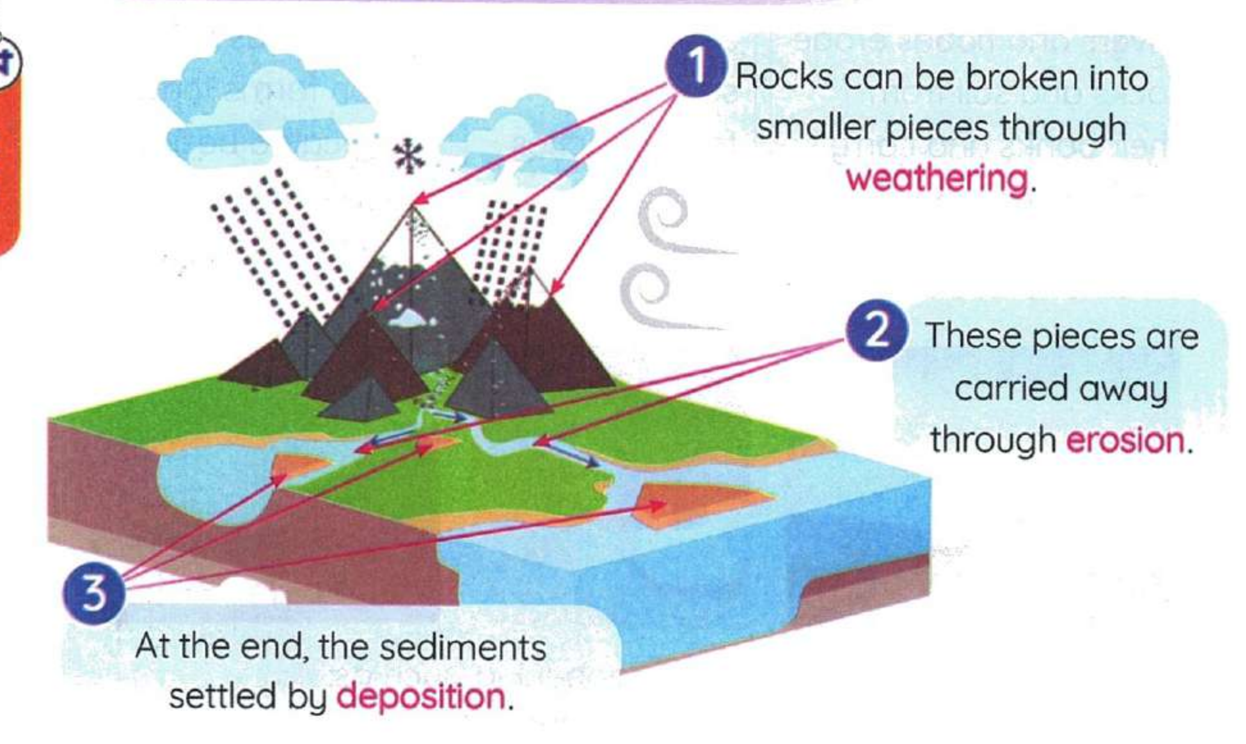
Check your understanding?

» Put (✓) or (✗):

1. Sometimes we can see erosion in action. ( )
2. Water can play an important role in weathering and erosion. ( )



Activity 10 Deposition

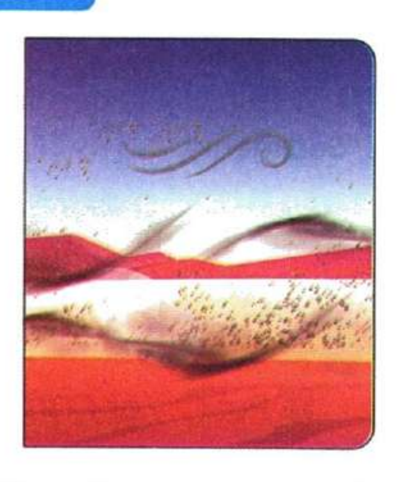


Deposition • It the process of settling rocks and soil in a new place after they have moved by erosion..

الترسيب: هو عملية استقرار الرواسب في مكان جديد بعد تحرُّكها بفعل التعرية.

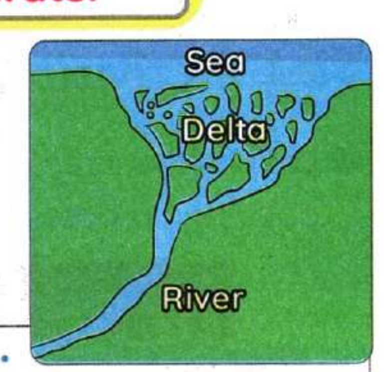
How does deposition occur?

1. As the wind blows, it picks up sand, then tosses it around in the air.
2. As the wind moves, sand travels with it.
3. When the wind stops blowing, the sand falls to the ground and is deposited.



[1] عندما تهب الرياح، فإنها تحمل الرمال ثم تقذفها في الهواء. [2] كلما تحركت الرياح تتحرك معها الرمال.
[3] عندما تتوقف الرياح عن الحركة تسقط حبات الرمال وتستقر (تترسَّب) على الأرض.

The role of deposition by water



- A river may deposit a sand bar along its banks.
- A river could carry sediment, and when the **river** meets the **sea**, sediments may be deposited.
- This forms a **delta**, such as the **Nile Delta**.

- يعمل النهر على ترسيب شريط من الرمال على طول ضفافه.
- يمكن للنهر **حمل الرواسب**، وعندما يصب النهر في البحر تترسَّب بعض الرواسب التي يحملها النهر في قاع هذا البحر.
- بذلك تتشكَّل الدلتا **مثل** دلتا نهر النيل.

Delta

It is a fan-shaped (triangle-shaped) that has a mass of mud and sediments formed when a running river enters a large water body (sea or ocean).

The role of deposition by wind

• **Strong wind can form large sand dunes, such as:** 1 Western Desert in Egypt 2 Rub' Al Khali in Arabian Peninsula.	• **Weak wind can form small sand dunes, such as:** Small dunes on a beach.

Erosion and deposition are linked processes

1. If rocks become eroded, → then → they must be deposited.
2. If you see a deposit of sand → this means → it has already been eroded somewhere else.



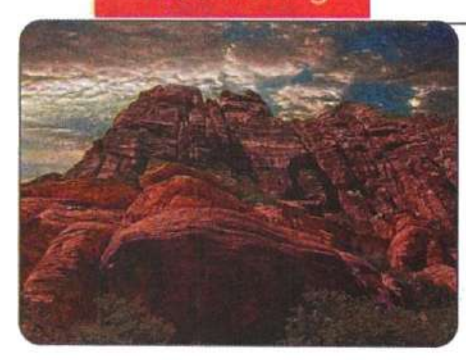
Lesson 5



Activity 11 Evidence of Change

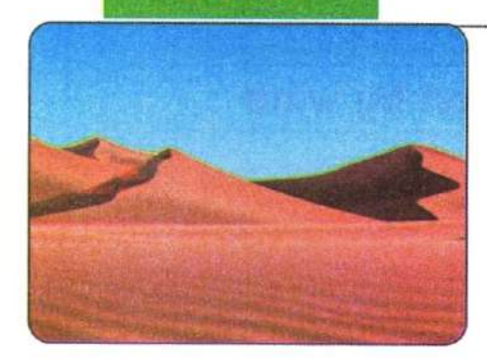
Look at the three images shown and consider what you have learned about the processes of **weathering**, **erosion**, and **decomposition**.

Weathering



Weathering is caused when wind or water break down the rocks and change the shape of the landform by mechanical or chemical processes.

Erosion

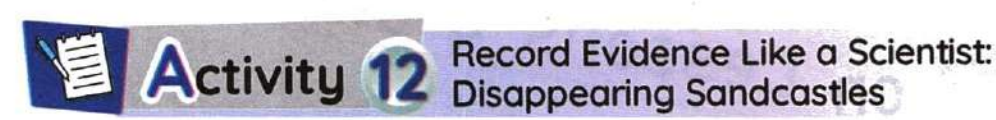


Erosion is caused when wind or water move material from one place to another.

Deposition



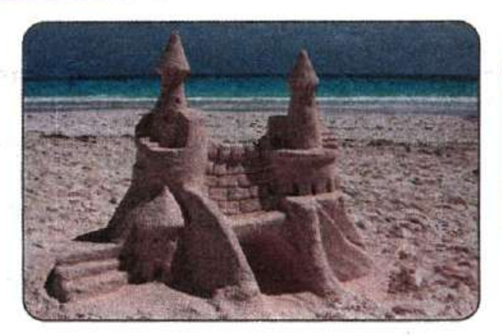
Deposition occurs when eroded materials stop moving and settle on a surface, often forming layers over time.



Activity 12 Record Evidence Like a Scientist: Disappearing Sandcastles

Disappearing Sandcastles

Now, you will use your new ideas about disappearing sandcastles to write a scientific explanation that answers the Can You Explain?





Question:

- How do wind, water, and weather change the Earth's surface?

My Claim:

- ....

....

Evidence:

- ....

....

Scientific Explanation with Reasoning:

- ....

....

Exercises on Lessons 4 and 5

1 Choose the correct answer:

1. .... is the moving of sand or rocks to another place.
   a. Weathering b. Erosion c. Deposition d. Decomposition
2. The force of .... pulls rocks from the top of the mountain to its bottom.
   a. river water b. seawater c. rainwater d. gravity
3. .... erode(s) rocks and soil from their banks.
   a. Rivers b. Waves c. Rainwater d. Gravity
4. When a river carrying sediments meets a sea, ... is formed.
   a. canyon b. sand dune c. delta d. snow
5. .... is a process of settling rocks after moving to a new place.
   a. Weathering b. Erosion c. Deposition d. Evaporation
6. Weathered rocks can be eroded by all the following factors, except ....
   a. gravity b. water c. sunlight d. wind
7. A gentle wind can form ....
   a. a delta b. small sand dunes
   c. large sand dunes d. a mountain
8. .... occurs when eroded sediments stop moving and begin to build up.
   a. Deposition b. Erosion c. Weathering d. Photosynthesis
9. Wind can create a hill of sand called ....
   a. delta b. a canyon c. a valley d. a sand dune
10. Gentle wind can carry sand grains for .... distance
    a. short b. long c. huge d. very long

2 Put (✓) or (✗):

1. The gravitational force can cause erosion of the rocks. ( )
2. Sometimes you can see erosion happening. ( )
3. As the wind becomes stronger, it carries the sand grains for a shorter distance. ( )
4. After weathering, small rock particles pile up and aren't moved from their place. ( )
5. Sediments are deposited where they are eroded and picked up. ( )
6. Blowing sand grains from one place to another by wind is called deposition. ( )
7. A delta is a rectangular-shaped mass of sediment formed when a river meets the sea. ( )
8. Pulling sand from seashores by sea waves is called erosion. ( )
9. The deposition process never changes the shape of the Earth's surface. ( )
10. The formation of sand dunes in the Eastern Desert in Egypt is due to the movement of winds. ( )
11. Floods are one of the factors that cause water erosion. ( )
12. The erosion process is usually followed by the weathering process.( )

3 Write the scientific term:

1. It is the process that occurs when soil is moved from one place to another. (..................)
2. It is an eroding factor that pulls the rocks down mountainsides. (..................)
3. It is an eroding factor that moves rocks from their banks downstream. (..................)
4. It is the process that lays sand down when the wind stops blowing. (..................)
5. It is a landform of deposited sediments formed when a river meets a sea. (..................)

4 Complete the following using the words between the brackets:

(water - Nile Delta - hurricane - deposition - gentle wind - Egyptian western desert)

1. A .... forms a small sand dune, while a .... forms large sand dunes like that in ....
2. .... is a fan-shaped mass of mud and sediments.
3. Wind, ... and gravity are natural factors that control erosion process.
4. The process of laying down of sediment after its erosion is called ....

5 Choose from column (A) what suits it in column (B):

Column (A)	Column (B)
1 Rain	a. erodes rocks from their banks downstream.
2 Gravity	b. pulls rocks down mountainsides.
3 Rivers	c. washes soil in a hilly farmland.

1 .... 2 .... 3 ....

6 Mention the process from these words:

(Weathering - Erosion - Deposition)

Case	Process
1 Acid rain fall on rocks.	
2 The wind stops blowing	
3 The formation of sand dunes	
4 Hurricanes and floods	
5 Formation of the delta	
6 Pulling sand from the beach	

7 Give reasons for:

1. Gravity is one of the eroding factors.

....

....

2. The formation of sand dunes.

....

....

3. Erosion and deposition are linked processes.

....

....

8 What happens if?

1. Rain falls on hilly farmland?

....

....

2. The wind stops blowing? **(Concerning the process happening to sand)**

....

....

3. River water settles some sediments at the meeting point with the sea?

....

....

Model Exams on Concept 4.1

Model Exam 1

Question 1

(A) Choose the correct answer:

1. Steep valleys formed due to flowing water erosion are called ....
   a. hills b. sand dunes c. canyons d. deltas
2. All the following are processes that change the Earth's surface, except ....
   a. erosion b. digestion c. weathering d. deposition
3. A canyon may take .... to be formed.
   a. minutes b. hours c. days d. years
4. Plant .... play an important role in the mechanical weathering process.
   a. leaves b. stems c. roots d. flowers

(B) What happens if? Oxygen gas reacts with iron found in rocks?

Question 2

(A) Put (✓) or (✗):

1. Water may cause chemical or mechanical weathering. ( )
2. The deposition process takes place before the erosion process. ( )
3. Pulling sand from seashores by sea waves is called erosion. ( )
4. Earth's surface changes from time to time. ( )

(B) Give a reason for: Formation of a red-rust layer on some rocks.

Question 3

(A) complete the following using the words between the brackets:

(expands - rocks - Limestone caves - weathering)

1. Sand is formed due to the breaking down of ....
2. .... are formed due to the combination of dissolved minerals.
3. Shaping of the Earth's surface begins with the .... process.
4. When water turns into ice, it .... and its volume increases.

(B) Write the scientific term:

They are tiny plant-like organisms that produce acids on rocks as they grow. (..........)

Model Exam 2

Question 1

(A) Choose the correct answer:

1. All of the following are reasons for the chemical weathering, except ....
   a. water b. plant roots c. acid rain d. oxygen gas
2. The force of .... pulls rocks from the top of the mountain to its bottom.
   a. river water b. seawater c. rainwater d. gravity
3. A gentle wind can carry sand grains for .... distances.
   a. short b. long c. huge d. very long
4. Weathered rocks can be eroded by all the following factors, except ....
   a. gravity b. water c. sunlight d. wind

(B) Write the scientific term:

The process of moving weathered rocks from one place to another. (............)

Question 2

(A) Put (✓) or (✗):

1. Plant roots help in the formation of rocks. (   )
2. The formation of sand dunes in deserts is due to the movement of water. (   )
3. The deposition process never changes the shape of the Earth's surface. (   )
4. Rivers erode rocks from their banks downstream. (   )

(B) Cross out the odd word:

Erosion – Weathering – Deposition – Digestion (.....................)

Question 3

(A) Choose from column (A) what suits it in column (B):

Column (A)	Column (B)
1 Delta	a. breaks rocks down without changing heir matter.
2 Mechanical weathering	b. changes the composition of the rocks.
3 Chemical weathering	c. is a process of settling rocks after moving to new place.
4 Deposition	d. is a landform of deposited sediments when a river meets the sea.

(B) What happens if? Acid rain falls on rocks?



Concept 2
Changing Landscapes

Concept Objectives:

By the end of this concept:

- Students can ask questions about the causes and stability of landforms that change slowly and quickly.
- Students can provide evidence that weathering and erosion by wind, water, and ice cause changes on the Earth's surface over time.
- Students can develop a model that describes patterns in the formation of deltas and predicts where deltas are likely to form.
- Students can describe the interactions between water and landforms in a watershed and between wind and sand dunes at the beach.
- Students can use evidence from patterns in rock formations to explain the changes in the Earth's surface over time.

Key Vocabulary:

- Canyon
- Delta
- Dune

Concept 2

Changing Landscapes

Lesson 1	
Activity 1	Can You Explain?
Activity 2	Canyons

Lesson 2	
Activity 3	Hands-on Investigation: Landscapes in Your Environment

Lesson 3	
Activity 4	Canyon Formation
Activity 5	Canyons and Valleys

Lesson 4	
Activity 6	Delta Formation
Activity 7	Wind Erosion

Lesson 5	
Activity 8	Hands-on Investigation: Sand Shifters
Activity 9	Describing Landforms

Lesson 1



» Many factors can change the Earth's surface and form new landforms, such as canyons.

• تساهم العديد من العوامل في تغيُّر سطح الأرض وتكوين تضاريس جديدة.

How are canyons formed



• A canyon is a landform that can be formed in many ways, including **weathering** and **erosion** by wind, water, and other factors.

• Canyons can take **millions of years** to be formed.

• الأخدود من التضاريس التي يمكن أن تتكوَّن بعدة طرق، منها: التجوية والتعرية بفعل الرياح والمياه وغيرها من العوامل.

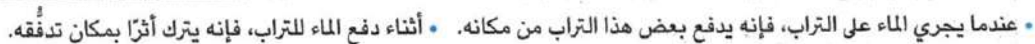
• يستغرق تكوُّن الأخاديد ملايين السنين.

Concept 2

Activity 2 Canyons



- When the water is moving over the sand, it pushes some of the sand out of the way.
- As the water moves the sand, it leaves an impression of where the water flowed.


• عندما يجري الماء على التراب، فإنه يدفع بعض هذا التراب من مكانه. • أثناء دفع الماء للتراب، فإنه يترك أثرًا بمكان تدفُّقه.

How can understanding the formation of landforms help predict future change?

- Scientists look for clues in nature to know how landforms were formed.
- Observe the opposite figure that represents a small canyon, then answer:

How does the small canyon formed?

- A stream of water may have formed it.

What is your evidence?

- There are trees and other plants on both sides that need water to grow.
- The sides are gently sloped as water helps wear the sides down.

What happens if? It rained a lot in a small canyon?

- The small canyon becomes deeper.

• يبحث العلماء عن أدلة لتحديد أسباب تكوُّن تضاريس سطح الأرض.

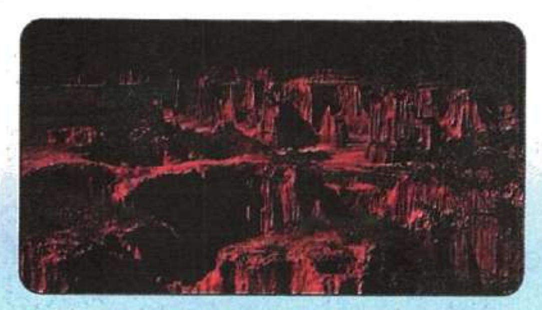
• كيف تكوَّن الأخدود الصغير؟ – تكوَّن الأخدود نتيجة لمجرى مائي.

• ما هي الأدلة على تكوُّن الأخاديد بفعل المجاري المائية؟

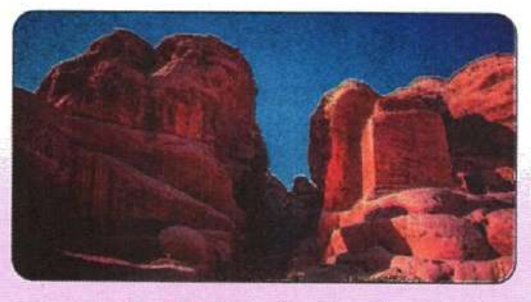
– وجود أشجار ونباتات على جانبي الأخدود تحتاج إلى الماء لتنمو. – جوانب الأخدود منحدرة حيث تسبَّبت المياه في تآكلها.

• إذا زادت الأمطار والمياه الجارية سيتسبَّب ذلك في زيادة عمق الأخدود الصغير.

» Observe the following figures, then put (✓) or (✗):


Small Canyons in Thailand


Wadi Nakhr in Oman


Wadi Rum in Jordan

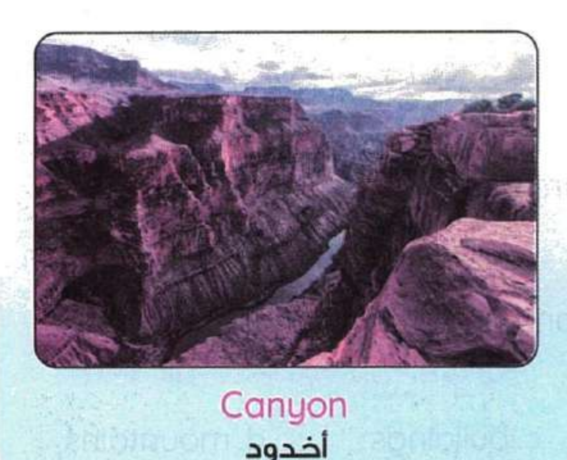

Colored Canyon in Sinai

1. All canyons have the same shape and color. ( )
2. Wadi Nakhr canyon has a reddish color. ( )
3. The colored canyon is V-shaped. ( )
4. All these landforms take a short period of time to be formed. ( )

» You can revise your answers from the following table that explain the similarities and differences between them:

Landform	In	Color	V-Shaped
Wadi Nakhr	Oman	Brown and Black	
Small Canyons	Thailand	Reddish	
Wadi Rum	Jordan	Reddish	✓
Colored Canyon	Sinai in Egypt	Reddish	✓

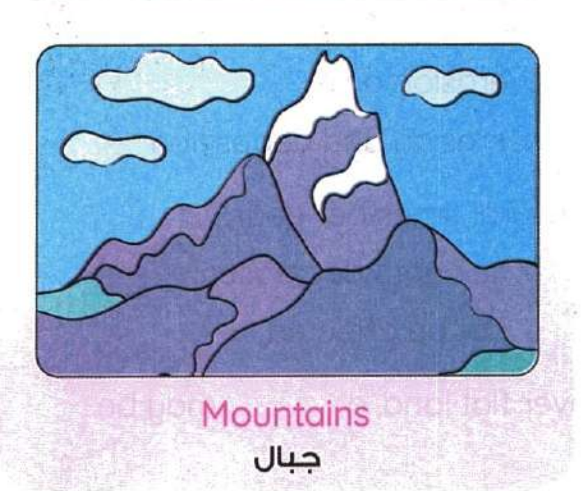
Examples of some landforms:



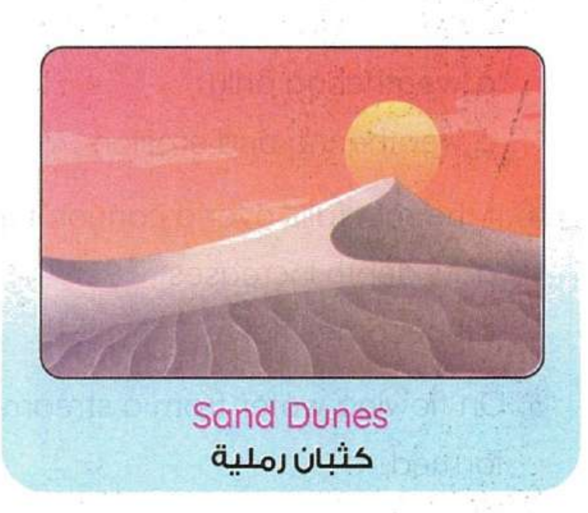
Canyon
أخدود



Valley
وادٍ



Mountains
جبال



Sand Dunes
كثبان رملية



Check your understanding?

Put (✓) or (✗):

1. Most canyons are formed by the effect of flowing water. (   )
2. The shape of the sand doesn't change when water flows over them. (   )
3. Colored Canyon has black and brown colors. (   )
4. Small canyons would get deeper if water ran through them again. (   )

Exercises on Lesson 1

1 Choose the correct answer:

1. A canyon may take .... of years to be formed.
   a. hundreds b. tens c. millions d. couple
2. All the following are examples of landforms found on the Earth's surface, except ....
   a. canyons b. dunes c. buildings d. mountains
3. Canyons can be formed in many ways, including ....
   a. weathering only b. erosion only
   c. weathering and erosion d. erosion and deposition
4. If the rain falls over a canyon for several times per year, ...
   a. its depth increases b. its depth decreases
   c. it becomes flat d. not be affected
5. On flowing water from a stream over flat land, a .... may be formed.
   a. large canyon b. small canyon c. hill d. sand dune
6. Reddish small canyons found in ....
   a. Egypt b. Oman c. Jordan d. Thailand

2 Put (✓) or (✗):

1. Valleys, canyons, and mountains are different landforms. ( )
2. Wadi Rum in Jordan is an example of a sand dune. ( )
3. A canyon may be formed by the effect of water only. ( )
4. All canyons have the same shape and color. ( )
5. The sides of the canyon at the beginning of its formation are gently-sloped. ( )

3 Write the scientific term:

1. A deep valley formed due to the weathering and erosion of wind and water. (..............)
2. A canyon whose rocks have black and brown colors. (..............)
3. A canyon that has a V-shaped in Egypt. (..............)

4 Complete the following using the words between the brackets:

(small canyon - impression - V-shaped - water stream - brown and black colored)

1. When the rain falls on a flat sandy land, it will leave an ....
2. Wadi-Nakhr is .... canyon.
3. Wadi Rum and colored canyon in Sinai are .... canyons.
4. In the beginning of a .... formation, plants and trees grow at the two sides of it due to the effect of a ....

5 Choose from column (A) what suits it in column (B):

Column (A)	Column (B)
1 Small canyon	a. is a black and brown canyon in Oman.
2 Wadi Rum	b. is a V-shaped canyon in Jordan.
3 Wadi Nakhr	c. is a reddish canyon in Thailand.

1 .... 2 .... 3 ....

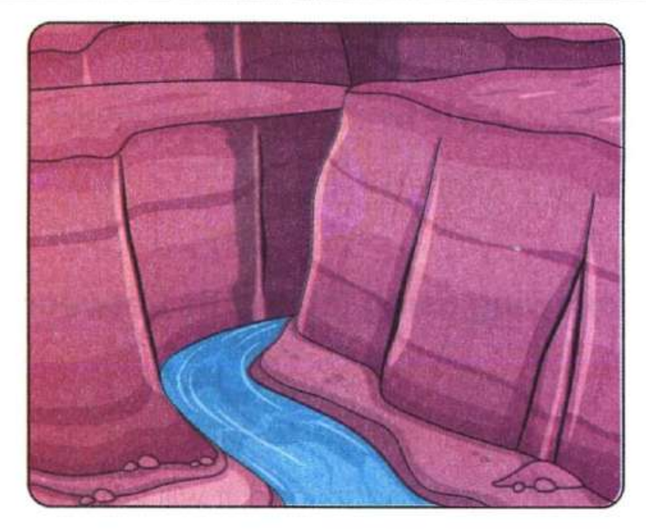
6 Cross out the odd word:

Mountain - Valley - Gravity - Canyon (..............)



Unit 4

7 Study the following figure, then complete the following sentences:



1. This figure represents a .... that is formed in .... of years.
2. .... and .... processes help in its formation.

8 Give reasons for:

1. Some small canyons have plants and trees on their sides.

....

2. Canyons all over the world have different properties.

....

9 What happens if?

1. A water stream flows over a flat land?

....

2. A lot of rain falls on a small canyon?

....

Lesson 2



Activity  Hands-on Investigation: Landscapes in Your Environment

» Put (✓) or (✗):

1. Sometimes we can see erosion happening. ( )
2. Weathering and erosion are rapid processes. ( )

On a rainy day, you can see some changes in the landscape around you on the street.

You can see the broken bricks and rocks due to the growth of roots.

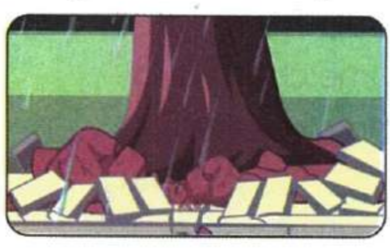
You can see cracks in the road.

You can see a patch of mud.

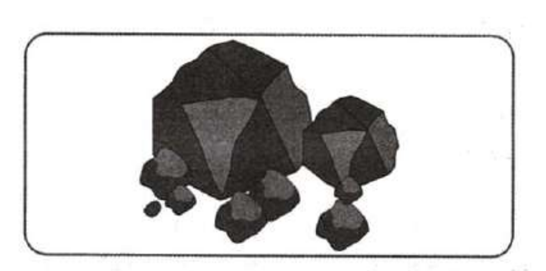
» You can see the same processes happen in large landscapes in nature, where:

1 Weathering process:

Instead of broken bricks and rocks due to the growth of roots,



you can see a rounded, worn rock.



2 Erosion process:

Instead of cracks in the road,

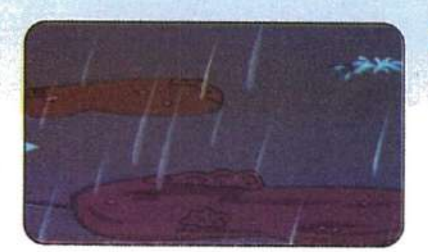


you can see the walls of the canyon were eroding due to the effect of water.

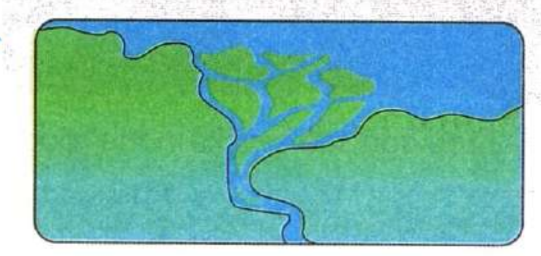


3 Deposition process:

Instead of a patch of mud,



you can see a river making new landforms, such as a delta.



Give a reason for...

- **Recognizing signs of weathering, erosion, and deposition is very useful.**

Because it helps us build houses in safe places, where:

• People must not build a house on a hill that is eroding.	
• People must not build a house very close to a river. G.R Because the river path may change, it may cause erosion and the deposition of houses.	

Check your understanding?

» Put (✓) or (✗):

1. When water falls on a small canyon, it could become deeper. (   )
2. People must build a house close to a river. (   )
3. A patch of mud in a street on a rainy day represents deposition. (   )
4. A canyon can be formed by long eroding by water. (   )

» Complete:

1. Rocks get broken down by ...., and moved through ...., and dropped, somewhere else through ....
2. When water falls on sand, it leaves an ....

Exercises on Lesson 2

1 Choose the correct answer:

1. The shape of a rock gets worn and rounded by the effect of .... process.
   - a. weathering
   - d. deposition
   - c. erosion
   - d. photosynthesis
2. .... is/are evidence of deposition.
   - a. A rounded, worn rock
   - b. A patch of sand on the ground
   - c. An area with canyons
   - d. Red-colored rocks
3. A running water stream can transport small rocks by .... process.
   - a. chemical weathering
   - b. erosion
   - c. deposition
   - d. mechanical weathering
4. A river may make a new .... at its end through the .... process.
   - a. mountain, deposition
   - b. canyon, erosion
   - c. land, deposition
   - d. land, weathering

2 Put (✓) or (✗):

1. When you find a worn rock, it's evidence of erosion. (   )
2. Understanding the formation of landforms helps predict future changes in landforms. (   )
3. It is better to build your house on a hill that is eroded. (   )
4. A river may create a delta from sediments by deposition. (   )
5. Deposition is one of the processes that change the Earth's surface. (   )
6. A river never changes its path, so it's safe to build a house near any river. (   )

3 Complete the following using the words between the brackets:

(erosion - many years - deposition - Weathering)

1. .... causes mountain rocks to break off.
2. An area with small canyons where soil was washed away after heavy rain is evidence of ....
3. Sediments can create a new land over long time by ....
4. The deposition process carried out by a river takes ....

4 Choose from column (A) what suits it in column (B):

Column (A)	Column (B)
1 A rounded, worn rock	a. is evidence of deposition.
2 An area with small canyons	b. is evidence of erosion.
3 A patch of sand on ground	c. is evidence of weathering.

1 .... 2 .... 3 ....

5 Give reasons for:

1. It is useful to recognize signs of weathering, erosion, and deposition.

....

2. It is not safe to build a house close to a river.

....

6 What happens if?

- A house is built close to a river?

....

Lesson 3





» Many valleys, including canyons, are formed in the same way.

Stages of valley formation

1. Gravity pulls rainwater downhill, forming small streams.
2. Small streams are joined together to form bigger streams (rivers).
3. The water of the river moves fast and erodes (carves out) rocks in its pathway.
4. When a river dries after a very long time, a new landform may be formed.

مراحل تكوين الوديان:

1 تعمل الجاذبية على سحب مياه الأمطار على طول المنحدر مُكوِّنة جداول صغيرة.
2 تتجمَّع الجداول الصغيرة مُكوِّنة جداول أكبر (نهر).
3 تندفع مياه النهر بسرعة وتقوم بتكسير (نحت) الصخور الموجودة في مسار النهر.
4 عندما يجف النهر بعد فترة طويلة جدًّا، فإنه قد يكون مظهر سطح جديد.

Factors affect the shape of the valley

1. The types of rocks
2. Speed of the river
3. Age of the river
4. Size of the river

NOTES:

- Big streams or rivers cause more erosion than small streams.
- Fast-moving water causes more erosion than slow-moving water.

Canyons

They are special types of valleys with steep sides.

الأخاديد: هي نوع خاص من الوديان تتميَّز بجوانبها المنحدرة.

- Canyons are exciting geologic landforms.
- People travel from all over the world to see and visit them.
- A canyon is a landform that can be formed in many ways, including **weathering** and **erosion** by wind, water, and other factors.

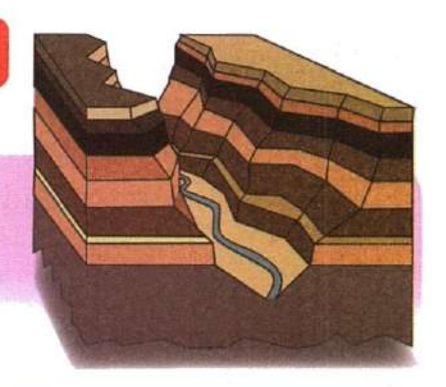
The Grand Canyon

Location:	United States of America
Age:	It is millions of years old.
Shape:	• It is very large and steep. • It contains many layers of rocks. • There is a river at the bottom.



- يعتبر أكبر أخدود في العالم.
- **يقع في:** الولايات المتحدة الأمريكية.
- **عمره:** يعود تكوينه إلى ملايين السنين.
- **الوصف (الشكل):**
  - أخدود كبير وعميق جدًّا.
  - يتكوَّن من العديد من الطبقات الصخرية.
  - هناك نهر يجري في أسفله.

Formation of the Grand Canyon



1. Over millions of years ago, the water of the river was moving so quickly down a steep slope.

2. The force of this rushing water eroded a lot of sediment and carried it away.

3. This process took many millions of years and leads to the formation of the Grand Canyon.

كيف تكوَّن الأخدود العظيم؟:

1. منذ ملايين السنين كانت مياه النهر تتحرَّك بسرعة كبيرة أسفل منحدر شديد الانحدار.
2. أدَّت قوة هذه المياه المتدفقة إلى تآكل الكثير من الرواسب وحملتها المياه بعيدًا.
3. استغرقت هذه العملية ملايين السنين؛ مما أدى إلى تكوين الأخدود العظيم.

Check your understanding?

» Put (✓) or (✗):

1. The bigger the stream, the more erosion it causes. ( )
2. Rivers erode rocks and can form valleys and canyons. ( )
3. The canyon walls are not very tall and have a gentle slope. ( )
4. A canyon is a type of valley. ( )
5. Rivers can change landform very slowly. ( )
6. Fast-moving rivers can cause a lot of erosion. ( )



Activity 5 Canyon and Valleys

- We have learned that canyons are a special type of valley.
- Let's study the similarities and differences between canyons and valleys.

P.O.C	Valley	Canyon
Figure		
Definition	• Valleys are lowland areas between mountains.	• Canyons are special types of valleys with steep sides.
Differences	• The sides are gently sloped. • They are surrounded by a wide, flat plain.	• The sides are steep. • They are surrounded by narrow and vertical walls. • They usually consist of many layers.
Similarities	• They are formed by rivers or streams. • They often have rivers or streams flow in the bottom.	

Check your understanding?

- Put (✓) or (✗):

1. Canyons are a special type of valley with gently sloped sides. (   )
2. The walls of valley are vertical and narrow. (   )

Concept 2

Exercises on Lesson 3

1 Choose the correct answer:

1. .... pulls rainwater downhill, forming small streams.
   a. Magnetism b. Gravity c. Sunlight d. Wind
2. .... can cause more erosion.
   a. A small stream b. A slow-moving river
   c. A big river d. A river moving on a flat land
3. When a river flows over a surface and carves out it, a .... is formed.
   a. canyon b. delta c. hill d. mountain
4. The movement of sediments down a fast-moving river is considered ....
   a. weathering b. erosion c. deposition d. rusting
5. All the following factors affect the shape of the valley, except ....
   a. the river's size b. the river's speed
   c. the rocks' type d. the rocks' color
6. A canyon and a valley are common in having ....
   a. gently sloped sides b. rivers at the bottom
   c. steep sides d. vertical walls
7. A .... is a deep valley with high, steep sides.
   a. hill b. mountain c. canyon d. dune
8. .... are lowland areas with gently-sloped sides.
   a. Valleys b. Deltas c. Canyons d. Dunes
9. A flowing river may form ....
   a. a valley b. a canyon c. a dune d. a and b

2 Put (✓) or (✗):

1. When a river moves down a steep slope, its speed decreases. (   )
2. A canyon is a type of valley with steep sides. (   )

3. A river can erode a mountain in a short period of time. ( )
4. The Grand Canyon took millions of years to be created. ( )
5. The Grand Canyon has a river at its bottom. ( )
6. Canyon walls are not very tall and have gentle slopes. ( )
7. A valley has high and steep walls with many layers of rocks. ( )
8. Both canyons and valleys often have rivers at their bottoms. ( )
9. Most valleys are formed due to the erosion of many sediments and their transfer far away. ( )
10. The shape of the valley depends on the type of rock. ( )
11. A slow-moving river has high energy, so it causes more erosion. ( )

3 Write the scientific term:

1. A force pulls rainwater downhill, forming small streams. (..........)
2. A special type of valley with steep sides. (..........)
3. The world's largest canyon, located in the USA. (..........)
4. They are often found at the bottom of both canyons and valleys. (..........)

4 Complete the following using the words between the brackets:

(less – high – more – gravity – increases – sediments – many layers)

1. Rainwater is pulled downhill, forming small stream due to ....
2. When the water of a river moves downhill a steep slope, the water speed .... that causes .... erosion.
3. A small stream causes .... erosion than a large river.
4. The force of rushing water erodes a lot of .... of a mountain and carried them away.
5. Walls of canyons are very .... and composes of ....

5 Study the following figure, then put (✓) or (✗):

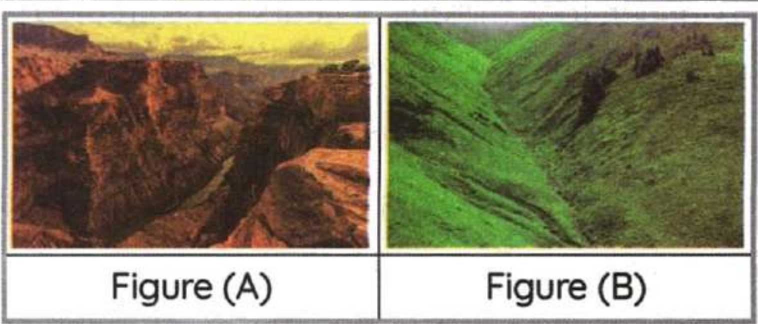


Figure (A)	Figure (B)

1. The landform in figure (A) has gently-sloped sides. ( )
2. The landform in figure (B) may surround some plains between mountains. ( )
3. Both landforms are formed due to erosion carried by rivers. ( )
4. The walls of the landform in figure (A) are higher than those in figure (B). ( )

6 Give reasons for:

1. Valleys and canyons are formed in the same way.

   ....

2. Rainwater is pulled downhill after falling on a mountain.

   ....

7 What happens if?

1. A river erodes the sediments of a mountain over a long period of time?

   ....

2. The water of a river moves downhill on a steep slope?

   ....

3. Small streams of water join together? (Concerning erosion)

   ....




Lesson 4

Activity 6 Delta Formation

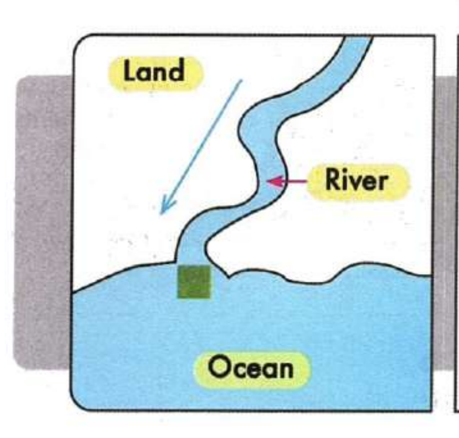
» Unlike valleys and canyons, deltas are not formed by erosion, but they are formed by deposition.

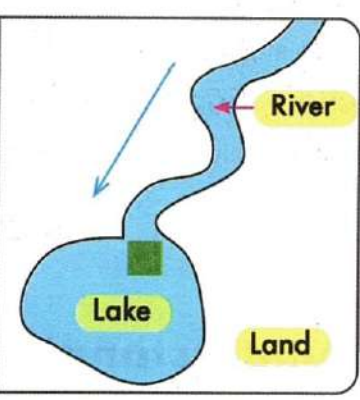
▪ على عكس الوديان والأودية، لا تتشكَّل الدلتا عن طريق عملية التعرية، ولكنها تتشكَّل عن طريق عملية الترسيب.

How is delta formed?



1. Fast-moving rivers carry sediments called silt.
2. The water of the river is full of sediment that has been collected along the journey.
3. When the rapid flowing water "of the river" enters still water "lake", or slower water "ocean or sea", water loses energy and drops the sediment that it is carrying forming a delta.





Silt is made up of very fine bits of sand, clay, or rock materials.

كيف تكوَّنت الدلتا؟:

1. تحمل المياه السريعة للأنهار رواسب تُسمى **الطمي**.
2. تكون مياه النهر مليئة بالرواسب التي جمعتها أثناء تلك الرحلة.
3. عند التقاء المياه السريعة (**النهر**) بالمياه الساكنة (**بحيرة**) أو مياه بطيئة (**المحيط أو البحر**) يتسبَّب ذلك في فقدان المياه لطاقتها؛ وبالتالي تترسب الرواسب التي تحملها مُكوِّنة الدلتا.



G.R

The wetland of plants in the delta helps in increasing deposition.

Because plant's roots are responsible for slowing down the water.

• تساعد جذور نباتات الأراضي الرطبة في الدلتا هذه الأراضي في زيادة عملية الترسيب.
حيث تقوم الجذور بإبطاء حركة المياه بشكل أكبر مما يزيد من عملية الترسيب.

Unit 4

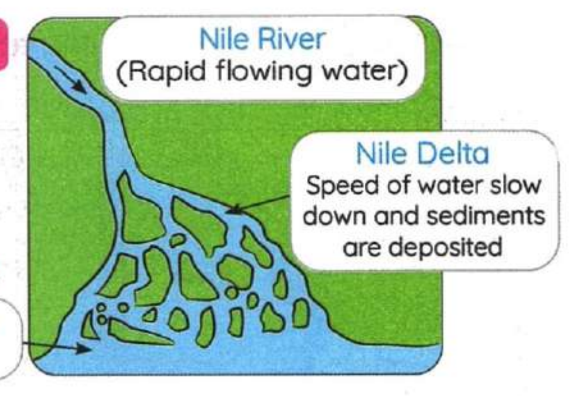
The Nile River Delta

"The most famous delta in the world".

Shape	Triangular shape
Area	It covers over 20,000 km² in Egypt
Location	Lies between Cairo and the northern coast of Egypt.
Importance	It is characterized by the presence of fertile soil that allows the cultivation of different types of crops.

How the Nile River Delta is formed:

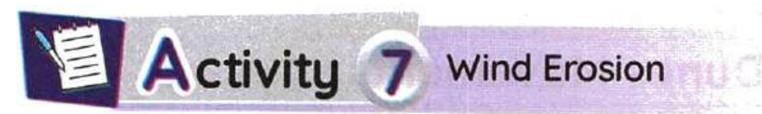
The Nile River travels a distance of about 6,600 km to pour into the Mediterranean Sea, where it drops its sediments, forming the Nile Delta.



Check your understanding?

» Put (✓) or (✗):

1. Canyons and deltas are landforms that were formed by the same process. ( )
2. Farmers use the rich soil in the delta to grow many crops in Egypt. ( )

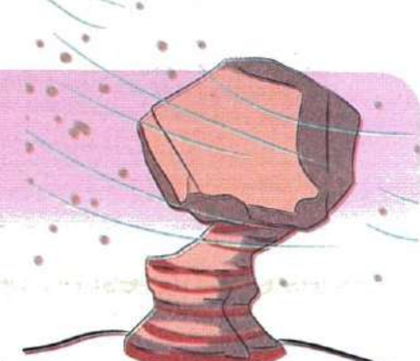


Activity 7 Wind Erosion

» The wind in the desert can be a powerful force for change.

• تعد رياح الصحراء من القوى الأساسية في إحداث تغيير في مظاهر السطح.

Steps of Erosion by Wind



1. When wind blows across the land, it picks up sand and other rock particles and carries them along.
2. When this flying sediment hits a rock, it wears down that rock like a sandblaster.
3. This process carves the rock into strange shapes.

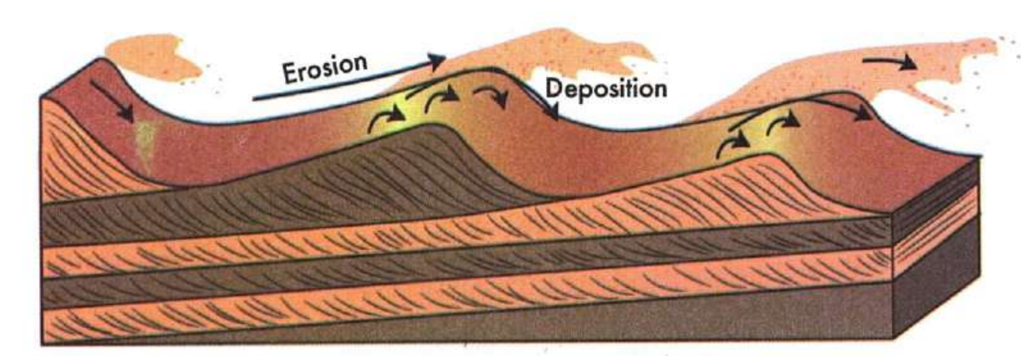
خطوات حدوث عملية التعرية بفعل الرياح:

1. تحمل الرياح القريبة من سطح الأرض الرمال وجزيئات الصخور وتنقلها من مكانها لمكان آخر.
2. عند اصطدام هذه الرواسب المتطايرة بالصخور، فإنها تعمل على نحت هذه الصخور كما لو كانت آلة كشط.
3. تقوم تلك العملية بتحويل الصخور إلى أشكال غريبة.

Sand Dunes

Shape	A hill of sand
Location	Sandy desert or sandy beach.
Area	• They are found in groups. • They may cover a large area. (Hundreds of meters tall).
Process	Erosion and deposition.
Factors	Wind-blown sand
How they are formed?	Sand dunes are formed when a barrier like a rock blocks the wind-blown sand.

Sand Dunes Movements



» Dunes are interesting because they are constantly moving, as follows:

1. **When wind blows across a dune,**
sand grains erode away from the side the wind is coming from.

↓

2. The grains of sand are carried up by the wind along the slope of the dune.

↓

3. **When they reach the top,**
the dune forms a barrier to the wind.
So, the sand grains roll down the other side.

[1] عندما تهب الرياح عبر الكثبان الرملية، تتحرك حبيبات الرمال بعيدًا عن الجانب الذي تأتي منه الرياح.
[2] تحمل الرياح حبيبات الرمل على طول منحدر الكثبان الرملية.
[3] عندما تصل حبيبات الرمال إلى القمة، تشكل الكثبان الرملية حاجزًا أمام الرياح؛ وبالتالي تتدحرج حبات الرمل لأسفل على الجانب الآخر.

Check your understanding?

» Put (✓) or (✗):

1. Sand dunes are formed by the erosion process only. (   )
2. Wind erosion can carve rocks in different shapes. (   )



Lesson 5



Activity 8 Hands-on Investigation: Sand Shifters

- Wind and sand work together to erode rocks.
- When the wind stops blowing, sand and small rocks are deposited in a new place.



Experiment

In this experiment, you will create a model of sand dunes and study how they are moving.



Tools:

Aluminium foil pan	Sand	One rock	Straw

Steps:

1. Place a small rock on one side of the pan.
2. Put a suitable amount of sand on the other side of the pan.
3. Try to blow air on the sand using a straw.
4. Repeat the previous steps by changing the force and direction of the wind.

Observation:

» Sand moves by the force of the wind where,

- As the force of the wind becomes weaker, the sand moves for a shorter distance.
- As the force of the wind becomes stronger, the sand moves a longer distance.

» When we blow air in the same direction of the rock, the rock blocks the sand and collects it before the rock.

Conclusion:

» The dunes are often formed where something blocks the path of the sand, such as rock.

» The distance that the sand grains move depends on the force of the wind.

» The way the sand moves depends on the direction of the wind.

Check your understanding?

» Put (✓) or (✗):

1. The distance moved by sand depends on the direction of the wind. ( )
2. Sand dunes are in continuous motion due to the movement of the wind. ( )



» Examples of some landforms that were formed:

P.O.C	Canyons	Valleys	Deltas	Dunes
Figure				
Definition	They are deep valleys with steep sides.	They are lowland areas between mountains that are usually surrounded by a wide, flat plain.	They are fan-shaped landforms formed when rivers enter oceans or seas.	They are hills made of sand.
The way of formation	Weathering and Erosion "Water or Wind"		Deposition "Water"	Erosion and deposition "Wind"

» Erosion generally occurs "slowly", but in cases of storms or rockslides, the erosion process may occur rapidly.

• التعرية تحدث عمومًا « ببطء »، ولكن في حالات العواصف أو الانزلاقات الصخرية قد تحدث عملية التعرية « بسرعة ».

• Rivers cause the formation of valleys and canyons.
• Wind and sand work together as a force of erosion in the desert.

• الأنهار هي المسئولة عادةً عن تكوُّن الوديان والأخاديد.
• تعمل الرياح والرمال معًا كقوى التعرية في الصحراء.

Exercises on Lessons 4 and 5

1 Choose the correct answer:

1. When a river meets a sea or an ocean, a landform known as a .... is formed.
   a. canyon b. volcano c. mountain d. delta
2. All the following are created by the water of rivers or streams, except a ....
   b. delta b. canyon c. valley d. sand dune
3. Silt carried by water contains all the following, except ....
   a. sand b. clay c. rocks d. glass
4. .... is the main process responsible for the formation of deltas.
   a. Deposition b. Erosion c. Weathering d. Photosynthesis
5. A delta is formed when a .... enters an ocean.
   a. lake b. river c. mountain d. hill
6. The Nile River Delta has ....
   a. a fertile soil b. a triangular shape
   c. an infertile soil d. a and b
7. A sand dune is formed by the .... process, then the .... process.
   a. deposition - erosion b. erosion - weathering
   c. erosion - deposition d. deposition - weathering
8. Sand grains in the desert can move forward or backward depending on the ....
   a. wind speed b. wind direction
   c. water speed d. water direction
9. Which of the following factors helps in the formation of sand dunes?
   a. Water b. Wind c. Light d. Heat
10. When a rock blocks the path of flying sand, a .... may be formed.
    a. dune b. river c. canyon d. delta

2 Put (✓) or (✗):

1. The Nile River Delta has fertile soil that allows the cultivation of different crops. ( )
2. A delta is formed when the speed of river water increases. ( )
3. Plants of wetland and their roots don't affect the deposition process. ( )
4. Silt carried by a river contains large bits of sand and clay. ( )
5. Sand dunes are formed when a rock blocks water-blown sand. ( )
6. Sand dunes may be found in a sandy desert or on a beach. ( )
7. Sand dunes are formed by the deposition process only. ( )
8. Sand grains are deposited on the same side of the rock where they are eroded. ( )
9. Wind can't break down a rock. ( )
10. Sand dunes are stable landforms that don't move. ( )
11. 📖 The formation of sand dunes in the Eastern Desert in Egypt is due to the movement of wind. ( )
12. 📖 Dunes are formed at the bottom of seas. ( )

3 Write the scientific term:

1. Sediments carried by a river that contains sand, clay, and rock materials. (..................)
2. A fan-shaped land that is formed when a river meets a sea. (..................)
3. The sea in which Nile River Delta pours its water. (..................)
4. A process that causes the carving of rocks into different shapes by wind-blown sand. (..................)
5. 📖 The landform that is formed by the erosion and deposition of sand. (..................)

4 Complete the following using the words between the brackets:

(deposition - canyon - fan - decreases - increases - delta)

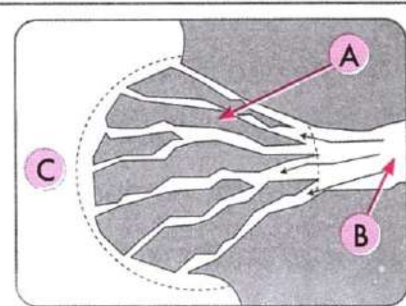
1. A .... is formed by the erosion process, while a .... is formed by the deposition process.
2. The Nile River Delta has a .... shape.
3. When the stream water speed ...., it causes .... of sediments.
4. When the force of blowing wind ...., the blown sand is carried for longer distance.

5 Choose from column (A) what suits it in column (B):

Column (A)	Column (B)
1 Erosion	a. is fine particles of clay, sand and rock materials.
2 Deposition	b. occurs when a stream water rushes quickly downhill a mountain.
3 Sand dunes	c. are hills of sand usually seen in groups and they may cover large areas.
4 Silt	d. occurs when a stream water speed slows down at the end of a river.

1 .... 2 .... 3 .... 4 ....

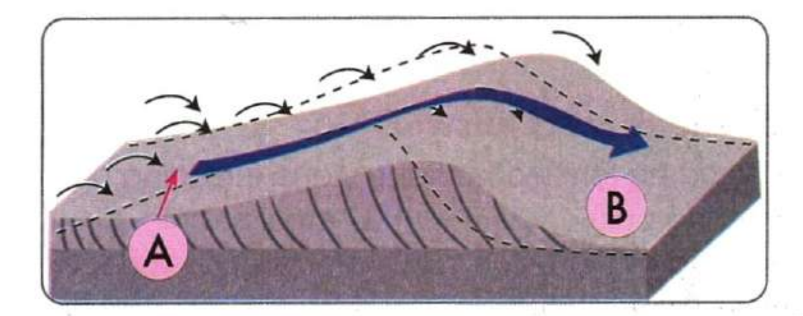
6 Study the following figure, then choose the correct answer:



1. The area (A) would become a .... (delta - canyon) due to the .... (erosion - deposition) process.
2. The .... (area "C" - area "B") could be a sea or a lake.
3. The .... (area "C" - area "B") is a river.



Study the following figure, then complete:



1. Erosion of sand occurs in area number ....
2. Deposition of wind-blown sand occurs in area number ....

8 Give reasons for:

1. Plants of wetland and their roots help in the formation a delta.

   ....

2. Silt carried by a river is deposited when the river enters the ocean.

   ....

3. Plants in wetland increase the deposition rate of silt carried by a river.

   ....

4. Sand dunes are formed in a desert.

   ....

9 What happens if?

1. A river carrying sediments meets a sea?

   ....

2. Wind-blown sand grains hit a big rock in desert?

   ....

3. Wind blows from South to North on sand dunes in a desert?

   ....

Model Exams on Concept 4.2

Model Exam 1

Question 1

(A) Choose the correct answer:

1. Canyons can be formed in many ways, including ....
   a. weathering only b. erosion only
   c. weathering and erosion d. erosion and deposition
2. The shape of a rock gets worn and rounded by the effect of the .... process.
   a. weathering d. deposition c. erosion d. photosynthesis
3. .... are lowland areas in between mountains with gently-sloped sides.
   a. Valleys b. Deltas c. Canyons d. Dunes
4. All the following are created by the water of rivers or streams, except a ....
   a. delta b. canyon c. valley d. sand dune

(B) What happens if? A lot of rain falls on a small canyon?

Question 2

(A) Put (✓) or (✗):

1. The sides of the canyon at the beginning of its formation are gently-sloped. ( )
2. A river may create a delta from sediments by deposition. ( )
3. Dunes are formed at the bottom of seas. ( )
4. Sand grains in the desert can move forward or backward depending on wind speed. ( )

(B) Give a reason for: It is not safe to build a house close to a river.

Question 3

(A) complete the following using the words between the brackets:

(more - delta - sand dune - less - sediments)

1. When a rock blocks the path of flying sand, a .... may be formed.
2. A .... is formed when a river carrying .... enters an ocean.
3. A small stream causes .... erosion than a large river.

(B) Write the scientific term:

A special type of valleys with steep sides. (..........)

Model Exam 2

Question 1

(A) Choose the correct answer:

1. Which of the following factors helps in the formation of sand dunes?
   a. Water   b. Wind   c. Light   d. Heat
2. A canyon may take .... of years to be formed.
   a. hundreds   b. tens   c. millions   d. couple
3. All the following factors affect the shape of the valley, except the ....
   a. river's size   b. river's speed   c. rocks' type   d. rocks' color
4. If the rain falls over a canyon several times per year, ...
   a. its depth increases   b. its depth decreases
   c. it becomes flat   d. it isn't affected

(B) Write the scientific term:

The two processes that cause the formation of canyons. (..............................)

Question 2

(A) Put (✓) or (✗):

1. Wadi Nakhar is a type of V-shaped canyons. (   )
2. When a river moves downhill on a steep slope, its speed decreases. (   )
3. Both canyons and valleys often have rivers at their bottoms. (   )
4. Sand dunes can be seen separately and cover a small area. (   )

(B) Cross out the odd word: Canyon – Valley – Gravity – Sand dune

Question 3

(A) Choose from column (A) what suits it in column (B):

Column (A)	Column (B)
1 Sand dunes	a. are lowland areas between mountains with genlty-sloped sides.
2 Valleys	b. they are formed by erosion and deposition.
3 Canyons	c. are fine bits of clay, sand, and rock materials.
4 Silts	d. are landforms that have steep-sloped sides.

(B) What happens if? A river carrying sediments meets a sea?

School Book

Assess your Learning on Unit 4

1 Choose the correct answer:

1. When a rock's surface is eroded due to weather factors, such as air or water, this indicates the occurrence of ....
   a. weathering b. deposition c. transfer d. erosion
2. Dissolving metals and forming rocks is an example of ....
   a. mechanical weathering b. weathering by wind
   c. deposition in rivers d. chemical weathering
3. Which of the following indicates the occurrence of a chemical weathering process?
   a. Water freezes inside cracks in rocks.
   b. Mixing the acidic water with rocks.
   c. Trees' roots grow inside cracks in rocks.
4. What is the process in which the landforms change due to weathering factors?
   a. Expansion b. Weathering c. Erosion d. Evaporation
5. When rocks are broken down into small pieces, this indicates the occurrence of .... process.
   a. mechanical weathering b. chemical weathering
   c. erosion by wind d. erosion by water
6. Which of the following is evidence of erosion?
   a. Sand dunes formation b. Forming rock crumbs
   c. Nile delta formation d. Forming of sedimentary rock
7. The formation of a red-rust layer in sedimentary rocks is evidence of the occurring of .... process.
   a. erosion of sedimentary rocks b. mechanical weathering
   c. chemical weathering d. transfer and deposit of crumbs
8. Steep valleys formed due to flowing water erosion are called ....
   a. canyons b. sand dunes c. hills d. deltas

9. The formation of sand dunes in the Eastern Desert in Egypt is due to the movement of ....

a. floods b. wind c. waves d. torrents

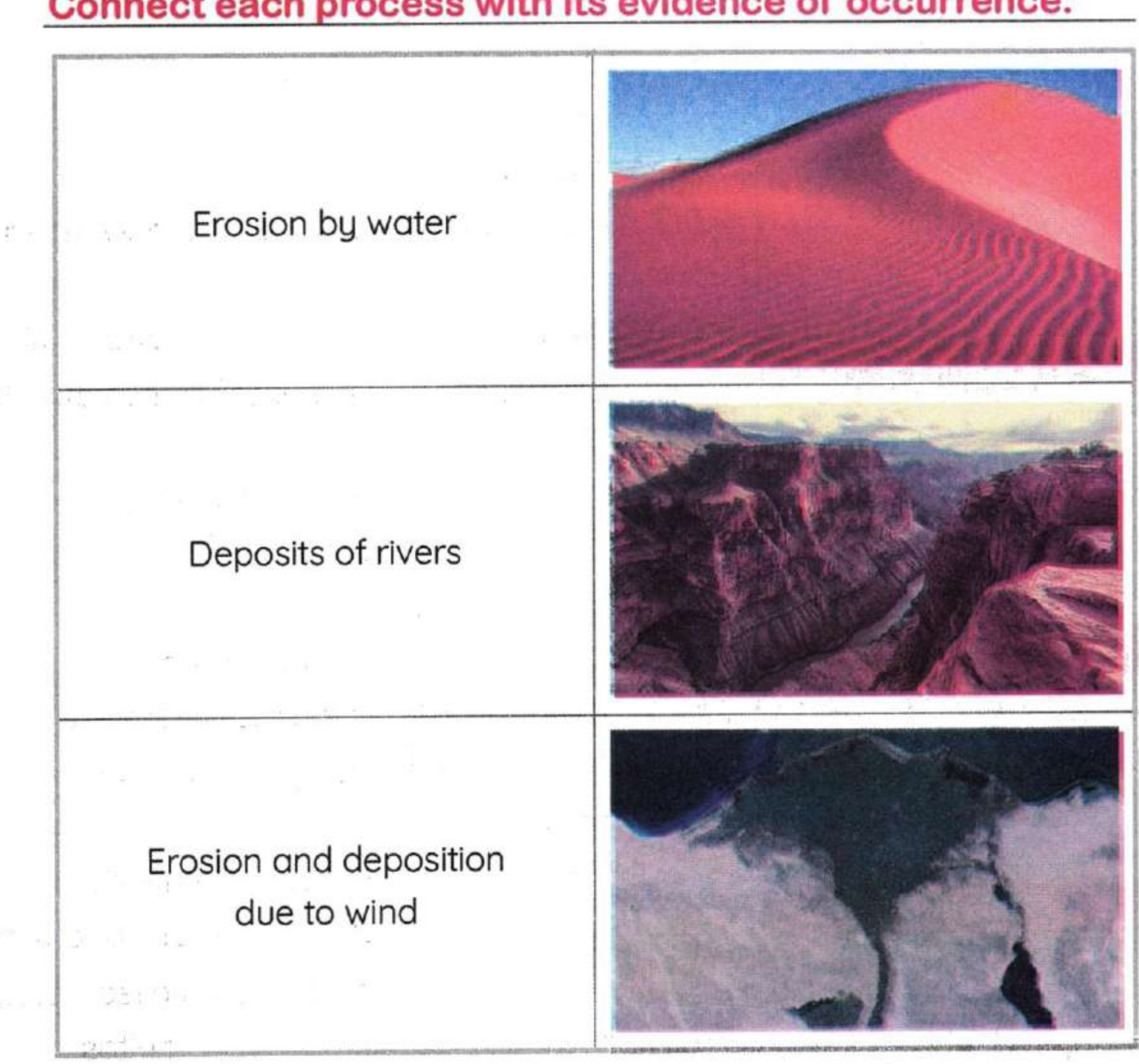
10. At the convergence of flowing river water that carries clay and sand sediments with the sea, a landform called a .... is formed.

a. delta b. sand dune c. dam d. canyon

11. Which of the following landforms is steep and formed due to the power of flowing water erosion?

a. Plain b. Valley c. Canyon d. Mountain

2 The following are photos of landforms. Each of them is evidence of the occurrence of a geological process. Connect each process with its evidence of occurrence:



Process	Photo
Erosion by water	
Deposits of rivers	
Erosion and deposition due to wind	

Glossary

Unit 3 – Concept 1 (Devices and Energy)

Lesson (1)

Devices الأجهزة	Energy طاقة	Convert يتحول
Technology تكنولوجيا	Remote-controlled cars سيارات تعمل بالتحكم عن بُعْد	Mars Curiosity Rover عربة اكتشاف المريخ
Solar panels الألواح الشمسية	Resources الموارد	Transform تحول
Truck شاحنة	Plane طائرة	Boat قارب
Operated remotely تعمل عن بُعْد	Tasks مهام	Turning corner الانعطاف
Battery بطارية	Store يخزن	Chemical energy الطاقة الكيميائية
Sensors مستشعرات	Electrical energy الطاقة الكهربائية	Sound energy الطاقة الصوتية
Run out ينفذ	Recharge إعادة شحن	Replace استبدال
Spacecraft مركبة فضائية	Missions بعثات	Socket/Plug مقبس

Lesson (2)

Consumed energy الطاقة المستهلكة	Input energy الطاقة المستهلكة	Produced energy الطاقة الناتجة
Output energy مخرجات الطاقة	Hairdryer مجفف شعر	Soap dispenser موزع الصابون
Movement حركة	Clapping تصفيق	Rubbing your hand افرك يديك
Growth نمو	Convert يتحول	Wood خشب
Burn حرق	Release ينتج	Coal فحم
Remains بقايا	Electrical cords أسلاك كهربائية	Electrical wire سلك كهربائي
Copper نحاس	Leaks out يتسرب	

Lesson (3)

Friction احتكاك	Road طريق	Approach يقترب
Disappear يختفي	Form يشكل	Attention انتباه
Electric bulb مصباح كهربائي	Washing machine غسالة	Analyze يُحلل
Determine احسب	Record سجل	Transfer ينتقل
Mixer/Blender خلاط	Warming التدفئة	

Lesson (4)

Energy flow مسار الطاقة	Track energy pathway تتبُّع مسار الطاقة	Cell phone (Mobile) التليفون المحمول
Vibrations الاهتزازات	Job/Function وظيفة	Lost مهدرة
Noise ضوضاء		

Unit 3 – Concept 2 (About Fuel)

Lesson (1)

Oil زيت	Coal فحم	Natural gas غاز طبيعي
Fossil fuel الوقود الحفري	Extract يستخلص	Underground باطن الأرض
Pointer مؤشر	Operate يشغل	Means of transportation وسائل النقل

Lesson (2)

Considered	يعتبر	Release	تنتج	Biofuel	الوقود الحيوي
Planted	مزروع	Renewable	متجدد	Corn	الذرة
Wood chips	رقائق الخشب	Ancient	قديم	Charcoal	فحم نباتي
Conservation	بقاء	Require	يتطلب	Deforestation	إزالة الغابات
Negative impact	تأثير سلبي	Remains	بقايا	Require	يتطلب
Pressure	ضغط	Conserve	يحفظ	Settle on	تستقر على
Replace	يستبدل	Sea creatures	كائنات بحرية	Cover	يغطي
Sediments	رواسب	Rocks	صخور	Run out	ينفذ
Convert	يحول	Available	متاح		

Lesson (3)

Steam	بخار	Regions	المناطق	Candle	شمعة
Appreciate	يقدر	Unplug	افصل الجهاز عن المقبس	Appliances	الأجهزة
Turbines	التوربينات	Generators spin	تدور المولدات		

Lesson (4)

Trap	يحبس	Industry	صناعة	Agriculture	الزراعة
Smog	الضباب الدخاني	Pesticides	مبيدات حشرية	Irritation	تهيج
Breathe	يتنفس	Lungs	الرئتان	Damage	يدمر
Acid rain	الأمطار الحمضية	Global warming	الاحتباس الحراري	Combine	يتحد
Atmosphere	الغلاف الجوي				

Unit 3 – Concept 3 (Renewable Energy Resources)

Lesson (1)

Windmills	طواحين الهواء	Watermills	طواحين المياه	Pipes	أنابيب
Machines	الآلات	Mill's blades	شفرات الطاحونة	Grind the grains	طحن الحبوب
Flour	الدقيق	Cost	تكلفة	Blow	تهب
Function	وظيفة	Old windmills	الطواحين القديمة	Modern turbines	التوربينات الحديثة
Sunrays	أشعة الشمس	Radiant energy	الطاقة الإشعاعية	Atmosphere	الغلاف الجوي
Greenhouse	الصوبة الزراعية	Farmers	المزارعون	Crops	محاصيل
Climate	مناخ	Concave mirrors	المرايا المنحنية	Collect	تجمع
Solar panels	الألواح الشمسية				

Lesson (2)

Irrigation equipment	معدات الري	Generator	المولد		

Lesson (3)

Dams	السدود	Evaporation	عملية التبخر	Condensation	عملية التكثيف
Pinwheel	مروحة ورقية	Water cycle	دورة المياه	Refill	إعادة تعبئة

Unit 4 – Concept 1 (Breaking Down and Moving Rocks)

Lesson (1)

Break down	تكسير	Weather change	تغيرات مناخية	Landscapes	مظاهر السطح
Wind blow	تهب الرياح	Wear away rocks	تفتيت الصخور	Weathering	التجوية
Sand dunes	الكثبان الرملية	Footprints	آثار الأقدام	Sandcastle	قلعة رملية
Collision	تصادم	Coastal rocks	الصخور الساحلية	Needle	الإبر
Canyon	الأخدود	Steep	منحدرة		

Lesson (2)

Erosion	التعرية	Deposition	الترسيب	Rushing water	ماء مندفع
Pebbles	حصى	Statue	تمثال	Peeling on a building	تقشير طلاء على المبنى
Rust	صدأ	Decide	يقرر	Evidence	دليل
Enormous	ضخم	Sand rushes	اندفاع الرمل	Sandpaper	ورق الصنفرة
Boulder	صخرة كبيرة	Dissolve	تذوب	Cave	كهف
Limestone	الحجر الجيري	Element	عنصر	Lichens	الأشنات

Lesson (3)

Antacid tablet	قرص مضاد للحموضة	Dissolution	تحلل	Exposed to	يتعرض لـ

Lesson (4)

Erode	يتآكل	Beach	شاطئ	Deposition	الترسيب
Farmland	الأراضي الزراعية	Flash floods	الفيضانات المفاجئة	Hurricanes	الأعاصير
Landslides	الانهيارات الأرضية	Creek	ممر مائي	Picks up	يحمل
Sediment	رواسب	Mud	طين	Remains	بقايا
Settling	استقرار	Western Desert	الصحراء الغربية	Peninsula	شبه جزيرة

Unit 4 – Concept 2 (Changing Landscapes)

Lesson (1)

Factors	عوامل	Impression	أثر	Evidence	الدليل
Clues	أدلة	Worn rock	صخرة متآكلة	Slope	انحدار – ميل
Deep	عمق	Valley	وادٍ		

Lesson (2)

Cracks	شقوق	Patch of mud	رقعة من الطين		

Lesson (3)

Streams	جداول مياه	Landforms	تضاريس	Carve	ينحت
Steep slope	منحدر شديد الانحدار	Layers	طبقات	Sediments	رواسب
Lowland	أرض منخفضة	Flat plain	سهل منبسط	Vertical walls	حوائط رأسية

Lesson (4)

Silt	طمي	Still water	مياه ساكنة	Particles	جزيئات
Waterland	أرض رطبة	Barrier	حاجز	Fertile soil	تربة خصبة

Lesson (5)

Wind direction	اتجاه الرياح	Wind force	قوة الرياح		



سلسلة كتب الأستاذ

SCIENCE

Revision Book

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Second Term



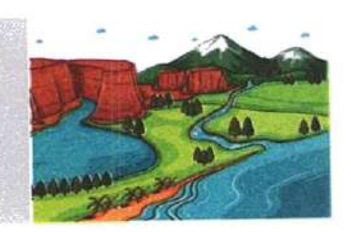


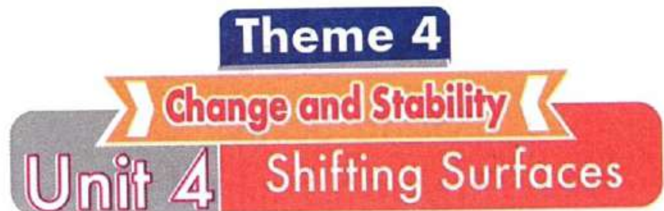
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Theme 3
Protecting Our Planet
Unit 3 Energy and Fuel





Theme 4
Change and Stability
Unit 4 Shifting Surfaces





Energy and Fuel

Unit Concepts:

Concept 1 Devices and Energy

Concept 2 About Fuel

Concept 3 Renewable Energy Resources

Concept 1 Devices and Energy

1 Summary of Concept 1

Battery

1. It is the source of energy for remotely-controlled toys.
2. It stores chemical energy inside it.
3. When a battery runs out (exhausts), it must be recharged or replaced with a new one.
4. It produces electrical energy.

Energy change inside a toy car:

Chemical energy (stored in the battery) → changes into → **electrical energy** → changes into → **kinetic energy and sound energy**

Mars Curiosity Rover:



Mars Curiosity Rover

1. It is a robotic vechile that explores Mars.
2. It is operated remotely from a distance.
3. It uses solar panels to get the electrical energy needed to recharge its batteries.
4. It takes about 6 months or more to reach Mars, as Mars is about 54 kilometers away from Earth.

Energy and devices:

1. Not all the energy in the energy chain reaches the device.
2. Some produced energy doesn't help the device do its function, and it's called "lost energy".
3. Most of the lost energy in a device leaks out in the form of heat.
4. The amount of energy that enters a device must be equal to the amount that comes out of it.

Law of Conservation of Energy

Energy is neither created nor destroyed; it can only be converted from one form to another.

Device	Consumed Energy (Input Energy)	Produced Energy (Output Energy)
• Hair dryer	Electrical energy	Thermal energy Sound energy Kinetic energy
• Blender (mixer) • Washing machine • Vacuum cleaner	Electrical energy	Kinetic energy Sound energy
• Television • Mobile phone	Electrical energy	Light energy Sound energy
• Electric fan	Electrical energy	Kinetic energy
• Electric iron • Kettle (boiler)	Electrical energy	Thermal energy
• Soap dispenser	Potential energy (Stored in the spring)	Kinetic energy (Movement of the soap upward)

Device	Consumed Energy (Input Energy)	Produced Energy (Output Energy)
• Hand bell • Drum • Guitar	Kinetic energy	Sound energy
• Radio • Door bell	Electrical energy	Sound energy
• Remote-controlled car	Chemical energy	Kinetic energy Sound energy
• Battery-powered clock	Chemical energy	Kinetic energy
• Flashlight	Chemical energy	Light energy Thermal energy
• Electric bulb (lamp)	Electrical energy	Light energy Thermal energy

Device	Output Energy	
	Energy that helps the device do its function	Lost Energy (doesn't help the device in its function)
• Hair dryer	Thermal energy	Sound energy
• Blender • Washing machine	Kinetic energy	Sound energy Thermal energy
• Mobile phone • Television	Light energy Sound energy	Thermal energy
• Remote-controlled car	Kinetic energy	Thermal energy

Energy chain:

- **Energy chain** is the path of energy from the Sun to different devices.
- Each energy chain starts with the **Sun**.
- The Sun is the main source of energy on Earth.

Examples of Energy Chains

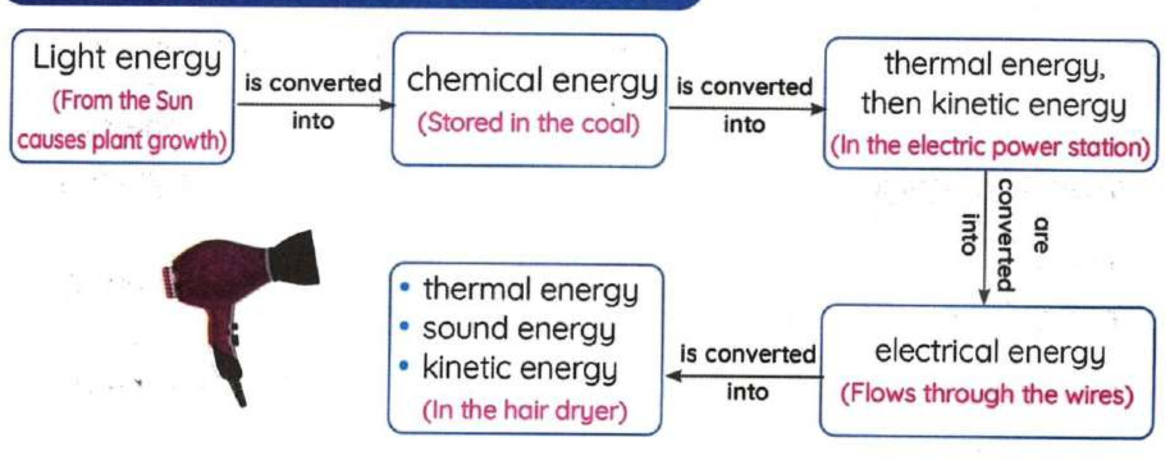
① Energy chain when eating food:

Light energy (From the Sun) → is converted into → chemical energy (Stored in the plant then in the human body) → is converted into → kinetic energy (Allows the body to move)

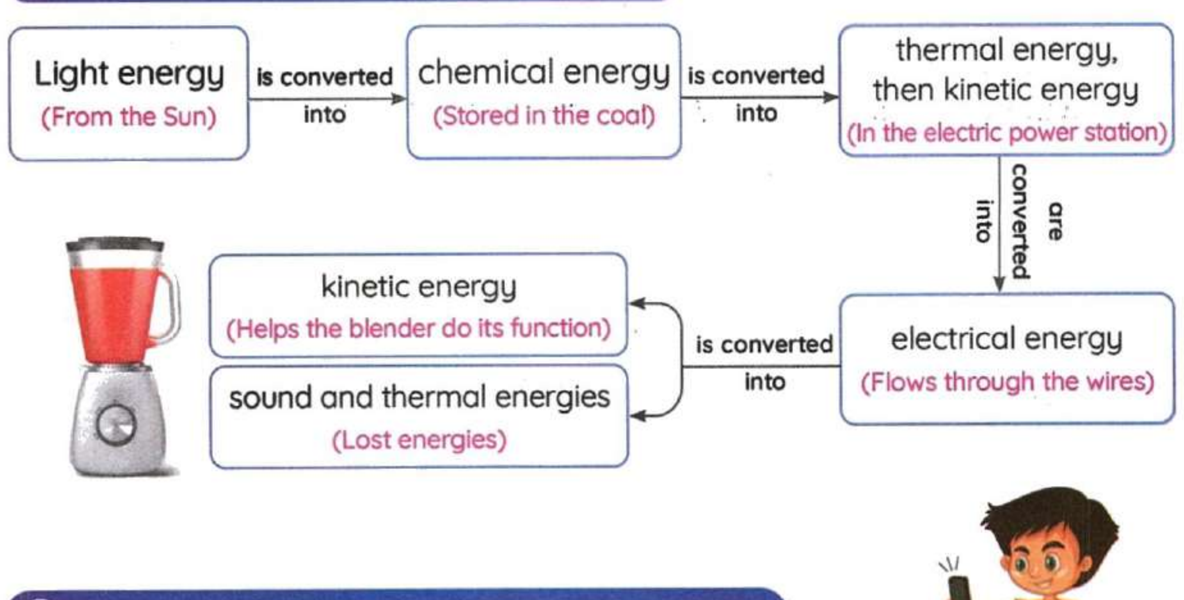
② Energy chain when heating a pot of water over a fire:

Light energy (From the Sun causes plant growth) → is converted into → chemical energy (Stored in the wood of plants) → is converted into → thermal energy (Released on burning the wood)

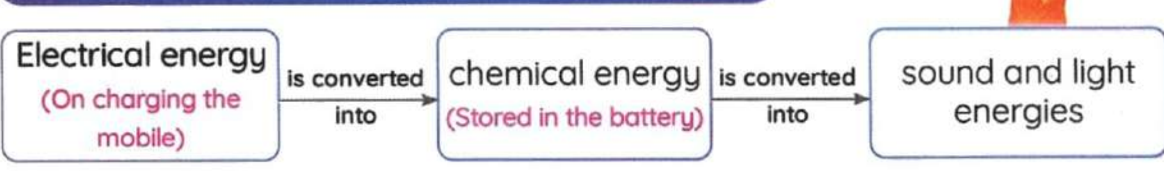




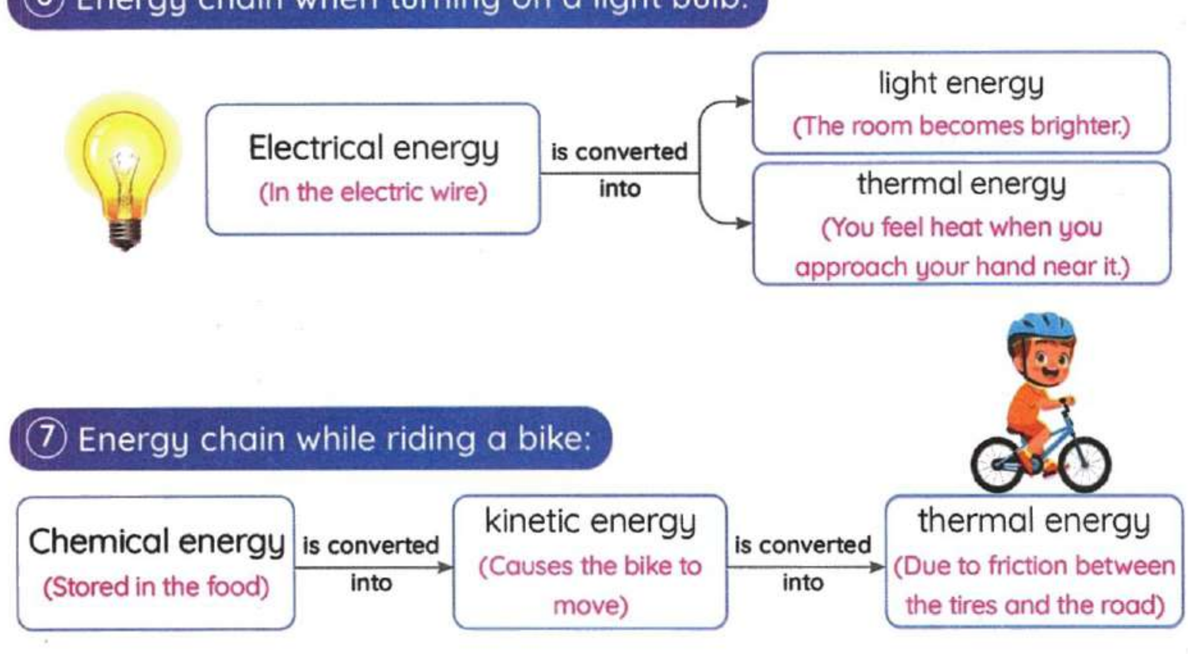
④ Energy chain when using the blender:



⑤ Energy chain when using the mobile phone:



⑥ Energy chain when turning on a light bulb:



2 Definitions of Concept 1

Term	Definition
Chemical energy	• It's a form of energy stored in the battery. • It's a form of energy stored in the human body.
Curiosity Rover	It's a robotic vehicle that can be controlled from a distance and is used to explore the surface of Mars.
Solar panel	It's a tool that converts solar energy into electrical energy in Mars Rover.
Input energy	It's the energy consumed in the device.
Output energy	It's the energy produced from the device.
Lost energy	It's the energy produced by the device that doesn't help it perform its function.
Energy chain	It is the path of energy from the Sun to different devices.
The Sun	It's the main source of energy for most forms of energies on Earth.
Thermal energy	• It's the energy produced when the wood of trees is burned. • It's the energy that is always produced due to friction. • It's the energy lost while using a computer.
Sound energy	It's the energy produced from playing the guitar or drums.
Light energy	It's the energy that helps a light bulb do its main job.
Electrical energy	It's the energy that flows in wires until it reaches the devices.
Copper	It's the material from which electric wires are made.
Law of Conservation of Energy	Energy is neither created nor destroyed; it can only be converted from one form to another.

3 Give Reasons for... Concept 1

1 All toys operated remotely need energy.

- To move and do tasks, such as turning corners or moving their arms.

2 After a while of operating a toy car, it stops.

- Because the batteries are exhausted.

3 The batteries used in the toys cannot be used to charge the Curiosity Rover.

- Because Mars Curiosity Rover is very far from any store or any plug.

4 Any energy chain starts with the Sun.

- Because the Sun is the main source of energy.

5 Energy is conserved.

- Because energy is neither created nor destroyed; it can only be converted from one form to another.

6 Not all the energy that enters the device reaches it.

- Because some of the input energy escapes into other forms that the device does not use.

7 During running, there is a change of energy that takes place inside your body.

- Because the chemical energy stored in the food is converted into kinetic energy that helps your body move.

8 When burning some wood from trees, there is a change in energy.

- When the wood from trees is burned, the chemical energy stored in the wood is converted into thermal energy.

9 When you touch an electric lamp, you feel heat.

- Because electrical energy changes into light and heat energies.

10 Thermal energy is considered a wasted material in some home devices.

- Because thermal energy doesn't help some devices do their main jobs.

4 What Happens if...? Concept 1

1 A toy car is operated remotely?

- The chemical energy stored in the batteries changes to electrical energy and then to kinetic energy to move the toy car.

2 The batteries of a toy car are exhausted?

- The toy car stops moving.

3 An electric bulb is operated?

- Electrical energy changes into light and thermal energies.

4 An electric fan is operated?

- Electrical energy changes into kinetic energy.

5 You rub your hands?

- Kinetic energy changes into thermal energy.

6 The bike rider pushes the paddles with his legs?

- The chemical energy stored in his body changes into kinetic energy.

7 You approach your hand to a light bulb?

- I will feel the heat of the lamp.

5 Revision on Concept 1

1 Choose the correct answer:

1 Most toys depend on .... as a source of energy.
a. water b. batteries c. fuel d. food

2 Batteries store .... energy inside them.
a. chemical b. electrical c. solar d. kinetic

3 Curiosity Rover is designed to explore ....
a. the Sun b. the moon c. Mars d. Earth

4 .... is considered the main source of energy on the Earth's surface.
a. Fuel b. The moon c. The Sun d. A battery

5 Some energy is lost in most devices in the form of .... energy.
a. electrical b. thermal c. sound d. kinetic

6 Electric wires are made up of ....
a. plastic b. wood c. iron d. copper

7 The input energy in Curiosity Rover is .... energy.
a. thermal b. solar c. electrical d. kinetic

8 All of the following store chemical energy, except ....
a. a battery b. an apple
c. a compressed spring d. coal

9 All the following devices produce thermal energy, except the ....
a. hair dryer b. watch c. kettle d. electric heater

10 The .... uses thermal energy to do its function.
a. mobile phone b. washing machine
c. TV d. hair dryer

11 The produced .... energy doesn't help the blender do its job.
a. sound b. thermal c. chemical d. potential

12 When you turn on your television, the electrical energy travels through the .... until it reaches it.

a. wires　　b. air　　c. screens　　d. plastics

13 During riding a bike, some kinetic energy is converted into .... energy due to the friction of the bike's tires with the road.

a. chemical　　b. potential　　c. thermal　　d. electrical

14 During charging a mobile phone, the .... energy is stored in the battery as .... energy.

a. chemical - electrical　　b. electrical - chemical

c. electrical - sound　　d. chemical - light

15 All the following are from the consumed or produced energies in the mobile phone, except the ....

a. chemical energy　　b. light energy

c. sound energy　　d. potential energy

2 Put (✓) or (✗):

1 Mars Rover and toy cars can be operated from a distance. (   )

2 Mars is located a few kilometers away from Earth. (   )

3 It takes several days for a spacecraft to reach Mars. (   )

4 Most energy chains start with the moon. (   )

5 The energy chain of a burning candle is composed of chemical energy converted into thermal energy and light energy. (   )

6 Energy can't be transformed from one form to another. (   )

7 Both the electric bulb and the electric heater produce thermal energy. (   )

8 When you rub your hands, kinetic energy changes to heat energy. (   )

9 The produced sound energy helps the blender do its function. (   )

10. There is energy loss when energy is transformed from one form to another. ( )
11. When pedalling a bike, the chemical energy in your body changes to kinetic energy. ( )
12. The produced sound energy helps the hair dryer do its function. ( )
13. The amount of energy entering any device equals the sum of the energies produced by it. ( )
14. The amount of electrical energy used to charge a mobile phone is greater than the produced light energy. ( )

3 Write the scientific term:

1. It's a robot vehicle that is used to explore the surface of Mars. (..................)
2. It's the form of energy that is stored in a battery. (..................)
3. It's the main source of energy for most forms of energies on Earth. (..................)
4. It's the energy produced when the wood of trees is burned. (..................)
5. It's the energy is stored in plants in the form of sugar. (..................)
6. It's a path that shows the energy flow from its source to the device. (..................)
7. It's a device used to convert electrical energy into light energy. (..................)
8. It's the output energy that helps the electric kettle do its function. (..................)
9. It's the energy produced from the blender that helps it do its job. (..................)
10. It's the energy produced from playing the guitar. (..................)
11. It's the lost energy when using a computer. (..................)
12. It's the energy that is always produced due to friction. (..................)
13. It's the material that electric wires are made from. (..................)
14. It's the lost energy when using the mobile for a long time. (..................)

4 Complete the following sentences:

1. In any energy chain, some of the energy is lost in the form of ....
2. The energies that are produced from the washing machine are .... energy and .... energy.
3. .... can be used in electric power stations to generate electricity.
4. In the electric heater, ... energy is considered an input energy, while thermal energy is considered an .... energy.
5. To operate an electric mixer, we use .... energy.

5 Cross out the odd word:

1. Food – Battery – Lamp – Coal (..........)
2. Hair dryer – Blender – Washing machine – Light bulb (..........)

6 Choose from column (A) what suits it in column (B):

A

Column (A)	Column (B)
1 Solar energy	a. is the source of energy for Curiosity Rover.
2 Chemical energy	b. is produced when the toy car is operated.
3 Kinetic energy	c. is stored inside a battery.

1 .... 2 .... 3 ....

B

Column (A)	Column (B)
1 Chemical energy	a. is the energy produced during running.
2 Sound energy	b. is the input energy in a soap dispenser.
3 Kinetic energy	c. is the produced energy from the radio.
4 Potential energy	d. is stored inside a tree.

1 .... 2 .... 3 .... 4 ....

C

Column (A)	Column (B)
1 Solar panels	a. converts electrical energy into sound energy.
2 Electric fan	b. changes electrical energy into light and thermal energies.
3 Radio	c. changes electrical energy into kinetic energy.
4 Electric bulb	d. change solar energy into electrical energy.

1 .... 2 .... 3 .... 4 ....

D

Column (A)	Column (B)
1 Chemical energy	a. is the lost energy when operating a mobile device for a long time.
2 Light energy	b. is used to charge the mobile battery.
3 Electrical energy	c. is stored inside the mobile battery.
4 Thermal energy	d. is produced from the mobile phone.

1 .... 2 .... 3 .... 4 ....

7 Study the following figures, then complete the questions below:

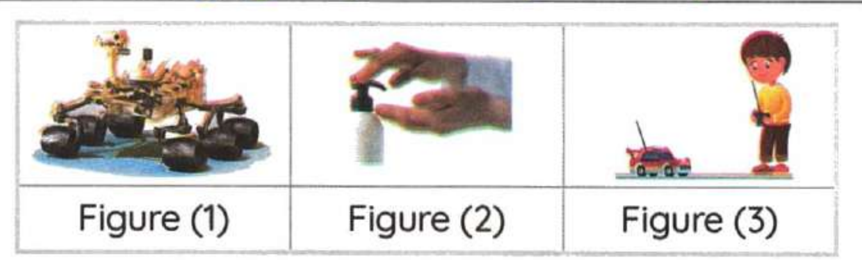


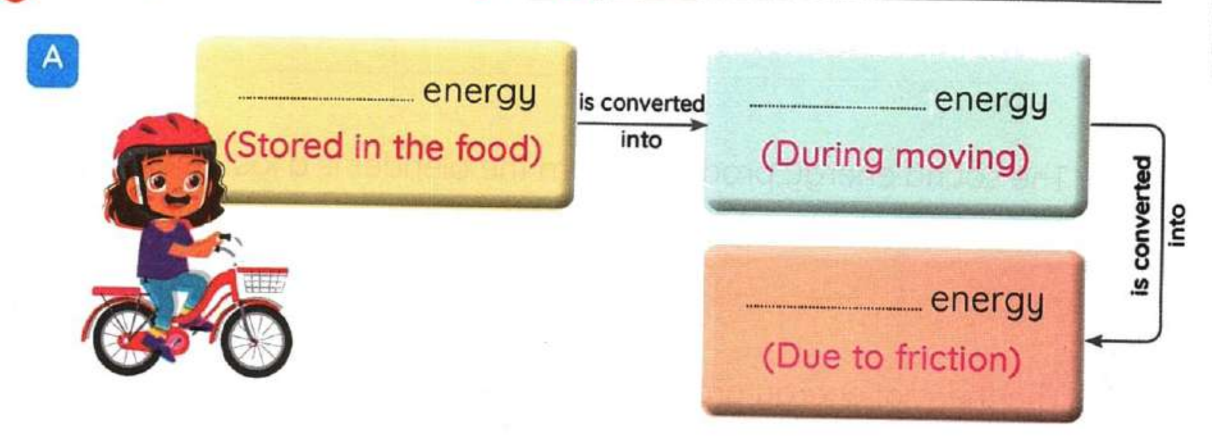
Figure (1) Figure (2) Figure (3)

1. .... energy is the output energy in all these figures.
2. Figure (........) depends on solar energy to be operated.
3. Figures (........) and (........) can be controlled from a distance.
4. The input energy of figure (........) is the chemical energy stored in the battery.
5. The input energy of figure (........) is potential energy.

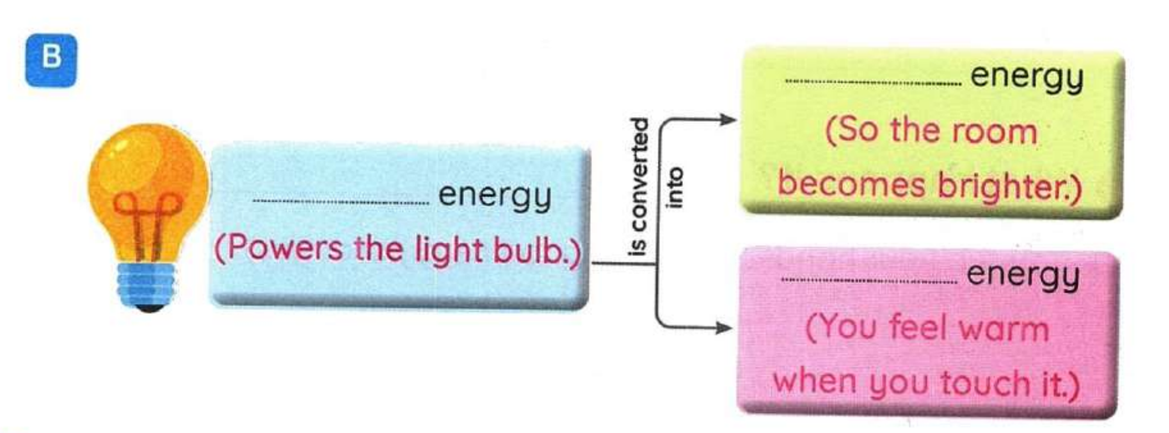


8 Complete the following diagrams:

A



B



9 Give reasons for:

1. The batteries used to operate toys can't be used in operating the Mars Rover.

....

....

2. There is a change in energy when burning the wood of trees.

....

....

3. During running, there is a change of energy in your body.

....

....

4 You feel warm when you put your hands near a lighted light bulb.

....

....

5 The sound energy produced from the blender is a lost energy.

....

....

6 The thermal energy produced from the electric heater isn't lost energy.

....

....

10 What happens if?

1 You rub your hands? (According to energy changes)

....

....

2 You switch on an electric bulb? (According to energy changes)

....

....

3 You operate an electric fan? (According to energy changes)

....

....

4 You operate your mobile device for a long time?

....

....

Concept 2 About Fuel

1 Summary of Concept 2

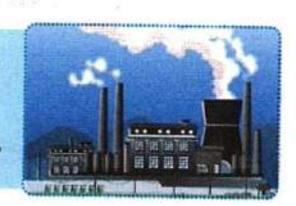
- The Sun is considered the main source of energy.
- Fuel stores chemical energy inside it.
- Fuel is a material that releases thermal energy when burned.

Uses of fuel:



Gasoline or natural gas
are used in operating all means of transportation.

Oil, natural gas, or coal
are used in generating electricity.





Coal or wood
are used in warming houses.

Coal, natural gas, or wood
are used in cooking food.



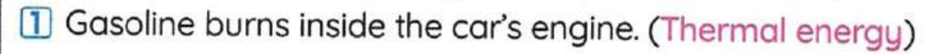
Cars and fuel

- A car needs fuel to move.
- As the speed of the car increases, the amount of used fuel increases.
- If the fuel runs out, the car will stop.

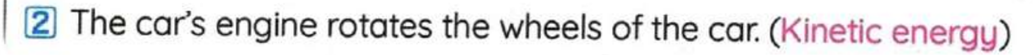


How is a car operated 





1. Gasoline burns inside the car's engine. (Thermal energy)



2. The car's engine rotates the wheels of the car. (Kinetic energy)

Types of fuel:

1 Biofuel Renewable resource	2 Fossil Fuel Nonrenewable resource
	
• It is the fuel that is made from living things that can be planted	• It is the fuel that was formed from the remains of plants and animals that lived millions of years ago. • Fossil fuel is extracted from underground.
Examples	
1 Wood (The most ancient fuel) 2 Grass 3 Corn 4 Charcoal (Made from wood) 5 Liquid fuel (Made from corn, grass, and wood chips)	1 Coal (Decomposition of the remains of ancient plants) 2 Oil and natural gas (Decomposition of marine animals) 3 Gasoline (Formed from oil)
Disadvantages	
• To get it, it requires cutting down trees which may lead to deforestation.	• Burning fossil fuel produces carbon dioxide gas that may cause air pollution, acid rain and global warming.

How do we conserve fossil fuel 

1. Walking or biking instead of driving a car.
2. Turning off the lights when you aren't in a room.
3. Replacing fossil fuel with renewable energy resources.

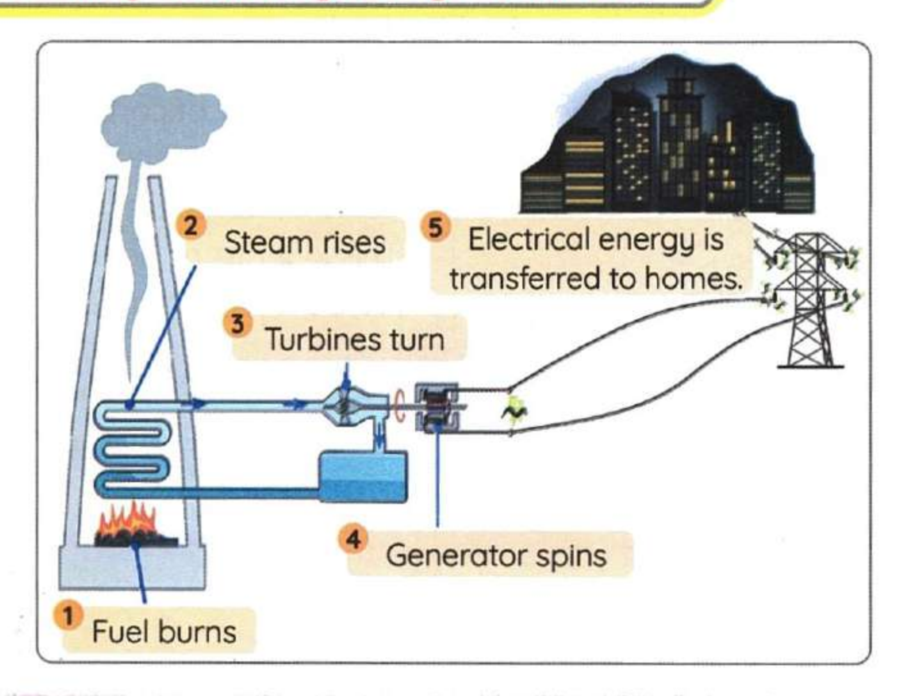
1 Acid Rain	2 Global Warming
Way of Formation	
• Carbon dioxide gas combines with water in the air to form acid rain.	1 The amount of carbon dioxide gas in the air increases forming a layer in the atmosphere. 2 This layer traps heat on the Earth, raising Earth's temperature.
Disadvantages	
1 Trees die. GR Due to the chemical changes in the structure of the soil. 2 Fish die. GR Due to the chemical changes in the structure of the lakes. 3 Decomposition of some rocks	• Increasing the Earth's temperature.





1 Water	2 Oil
Similarity	
• They're used to generate electricity.	
Differences	
• Renewable resource of energy	• Nonrenewable resource of energy
• We must use water carefully and not waste or pollute it. • If we waste or pollute water, it may not be replaced as quickly as we need.	Formation of oil: 1 Marine organisms died millions of years ago. 2 Layers of sediments and rocks cover the remains. 3 Over time, those remains are converted into oil due to extreme heat and pressure.

Generating Electricity Using Fossil Fuel





1 Fuel burns

- When fuel (coal, oil, or natural gas) burns, it releases thermal energy.



2 Steam rises

- This thermal energy is used to heat water to produce steam.



3 Turbines turn

- The steam is directed to tubes to turn turbines.



4 Generator spins

- Turbines make the generator spin and convert kinetic energy into electrical energy.



5 Electrical energy is transferred to homes

- Electrical energy travels through cables to homes and factories.

How do we conserve electricity



1. Turning off the lights we don't need.
2. Unpluging electrical appliances after using them.
3. Setting a regular electricity-free time.



Gasoline pointer	It's a device that helps the driver of the car check the amount of fuel.
Gasoline	It's a liquid that forms from oil and is used in moving cars.
Fuel	It's a material that releases thermal energy when it is burned.
Chemical energy	It's a kind of energy stored in fuel.
Thermal energy	It's the energy released from burning fossil fuel.
Renewable resources	• They are natural resources that are can be renewed after a short time of being used. • They are energy resources that include solar energy and hydroelectricity.
Nonrenewable resources	• They are energy resources that are used at a faster rate than they can be replaced. • They're energy resources that include all kinds of fossil fuel.
Biofuel	It is a type of fuel that is made from the living organisms that can be planted.
Fossil Fuel	• It is a type of fuel that is extracted from deep ground under the Earth's surface. • It is a type of fuel that is formed by the decomposition of old, dead organisms buried under the ground.
Oil and Natural gas	They are types of fossil fuel produced the decay of dead marine organisms (sea creatures).
Coal	It is a type of fossil fuel produced from the decomposition of ancient dead plants and trees.

Extreme heat and pressure	They're the factors needed for the formation of fossil fuel.
Charcoal	It is a kind of biofuel that is made from the wood of trees.
Liquid fuel	It is a kind of biofuel that is made from corn, grass and wood chips.
Wood	It is the oldest fuel that ancient people used.
Deforestation	It's a phenomenon that results from cutting trees at a faster rate to get wood.
Generator	It's a device that changes kinetic energy into electrical energy in electric power stations.
Carbon dioxide gas	It's a gas that causes global warming and acidic rains.
Global warming	It is a phenomenon in which the Earth's temperature increases when carbon dioxide gas increases in the air.
Acid rain	It is formed when carbon dioxide mixes with water in the air, and it causes the decomposition of some rocks and the death of trees.

3 Give Reasons for... Concept 2

1. Gasoline is very important for cars to move.
   - Because gasoline burns inside the car engine, allowing the engine to rotate the wheels.
2. The gasoline pointer is very useful for drivers.
   - To help the driver check the amount of gasoline (fuel) in the car.
3. Coal and wood are very important for warming houses.
   - Because they produce thermal energy when burned.

4. Biofuel is a renewable resource of energy.
   - Because it is renewed with the continuous growth of plants.

5. Fossil fuel is a nonrenewable resource of energy.
   - Because it starts to run out as we use it and can't be renewed easily.

6. Biofuel has a negative effect on the environment.
   - To get biofuel, it requires cutting down trees, which may lead to deforestation.

7. Fossil fuel has a negative effect on the environment.
   - Because burning fossil fuels produces carbon dioxide, which increases air pollution and causes global warming.

8. Using coal or natural gas in electric power stations.
   - To get the thermal energy needed to heat water and produce steam.

9. It is necessary to conserve fossil fuel.
   - To reduce air pollution.

10. Walking or biking is better than driving cars.
    - To reduce the amount of burning fossil fuel and reduce air pollution.

11. Water is a renewable resource of energy.
    - Because it is available and hasn't run out yet.

12. We must use water carefully, and not waste or pollute it.
    - Because if we waste or pollute water, we can't replace it as quickly as we need.

13. We should conserve electricity.
    - To avoid burning more fossil fuels and air pollution.

14. Generators play an important role in the electric power stations.
    - Because generators convert kinetic energy into electrical energy.

15. Turbines play an important role in electric power stations.
    - Because the kinetic energy of turbines is used to spin generators.

16. Engineers work on improving solar vehicles.
    - To reduce the burning of fossil fuel of normal vehicles and reduce air pollution.

17 Smog has a bad impact on the human's respiratory system.

- Because smog consists of small harmful particles that irritate the lungs and cause damage to lung tissues.

18 Formation of acid rain.

- Because carbon dioxide gas combines with water in the air to form acid rain.

19 Acid rain has many negative effects on the environment.

Because acid rain may cause:

1- The death of trees. 2- The death of fish.

3- The decomposition of some rocks, including bricks of buildings.

4 What Happens if...? Concept 2

1 The car's engine runs out of fuel.

- The car will stop.

2 We cut down trees at a fast rate to get wood.

- It leads to deforestation.

3 The remains of plants decompose over millions of years.

- Coal will be formed.

4 The remains of sea animals decompose over millions of years.

- Oil or natural gas will be formed.

5 We waste water or pollute it.

- We may not be able to replace it as quickly as we need.

6 Generators are turned on.

- Generators change kinetic energy into electrical energy.

7 A person is exposed to smog.

- Smog will irritate his/her eyes and lungs.

8 Carbon dioxide gas forms a layer in the atmosphere.

- Global warming happens because Earth's temperature increases slowly.

5 Revision on Concept 2

1 Choose the correct answer:

1. All the following are found deeply under the Earth´s surface, except ....
   a. coal   b. oil   c. natural gas   d. green plants

2. .... energy is stored inside coal.
   a. Thermal   b. Solar   c. Chemical   d. Electrical

3. If we are going on a long road trip, we must check the ....
   a. seats   b. doors   c. speedometer   d. gasoline pointer

4. Fuel is used as a source of .... energy.
   a. thermal   b. chemical   c. light   d. solar

5. All the following are extracted from underground, except ....
   a. coal   b. charcoal   c. petroleum   d. natural gas

6. .... is a renewable resource of energy.
   a. Oil   b. Coal   c. Gasoline   d. Corn

7. Coal is formed underground due to the decomposition of dead ....
   a. plants   b. animals   c. humans   d. birds

8. .... takes millions of years to be formed.
   a. Coal   b. Charcoal   c. Wood   d. Corn

9. One of the disadvantages of overusing biofuel is ....
   a. overfishing   b. wildfire   c. deforestation   d. acid rain

10. Both water and oil ....
    a. are renewable resources   b. are nonrenewable resources
    c. have the same structure   d. can be used to generate electricity

11. By heating water, it turns into ....
    a. steam   b. ice   c. electricity   d. fuel

12 The steam produced in the electric power station is directed into tubes to turn the ....

a. turbines b. motors c. mills d. lamps

13 Electrical energy travels through .... to homes and factories.

a. tubes b. motors c. cables d. fans

14 .... and .... are included in fossil fuel formation.

a. Heating - cooling b. Burying - cooling
c. Decaying - heating d. Decaying - growth

15 Smog damages the tissues of the .... system.

a. digestive b. circulatory c. respiratory d. nervous

16 Cars' smog causes irritation of humans' ....

a. small intestines b. brains c. hearts d. eyes

17 Acid rain is formed when .... combines with water.

a. oxygen b. carbon dioxide
c. hydrogen d. nitrogen

18 Using .... to produce electrical energy is expensive.

a. solar energy b. oil c. natural gas d. coal

19 Burning fossil fuel causes all the following, except ....

a. pollution b. acid rain c. global warming d. deforestation

2 Put (✓) or (✗):

1 As the speed of the car increases, the amount of the used fuel decreases. ( )

2 We cannot drive a car if the gasoline inside the fuel tank runs out. ( )

3 Thermal energy is produced by burning a piece of wood. ( )

4 Cars, buses, and bicycles need gasoline to run on roads. ( )

5 Coal is the oldest fuel that has been used all over the world by ancient people. ( )

6 Fossil fuel is made from living things that can be grown. ( )

7 The consumption rate of coal is slower than its formation rate. ( )

8 Water may not be replaced as quickly as we need. ( )

9. Some plants are used to make liquid biofuel. ( )
10. The movement of a generator in an electric power station produces potential energy. ( )
11. Turbines are operated by steam in electric power stations. ( )
12. Using energy-saving light bulbs conserves electricity. ( )
13. On cooling water, it turns into steam in electric power stations. ( )
14. Pesticides cause soil and water pollution. ( )
15. When the burning of fossil fuel increases, the temperature on Earth decreases. ( )
16. Mixing water with oxygen gas produces acid rain. ( )
17. The amount of fossil fuel on Earth is unlimited. ( )

3 Write the scientific term:

1. It's a device that helps the car driver check the amount of fuel. (..................)
2. It's a liquid fossil fuel that burns inside the car engine.(..................)
3. It's a kind of energy that is stored in fuel. (..................)
4. It's a form of energy produced by burning fuel. (..................)
5. It's a material that releases thermal energy on burning. (..................)
6. It is a natural resource that is used faster than it can be replaced. (..................)
7. It is a natural resource that can be replaced soon after it is used. (..................)
8. It is the fuel that is made from living organisms that can be planted. (..................)
9. It is the fuel that is extracted from deep ground under the Earth's surface. (..................)
10. It's a kind of fossil fuel that is produced from the decomposition of dead marine organisms. (..................)
11. It's a kind of fossil fuel that is produced from the decomposition of dead plants. (..................)
12. It's a kind of biofuel that is made of the wood of trees. (..................)

13 It's a kind of biofuel that is made of corn and grass. (..........................)

14 It's the energy produced by the generator. (..........................)

15 It's a device that operates generators. (..........................)

16 It's a device in the electric power stations that changes the kinetic energy into electrical energy. (..........................)

17 It is a phenomenon in which the Earth's temperature increases when carbon dioxide gas increases in the air. (..........................)

18 It is a phenomenon that causes the decomposition of some rocks and the death of trees. (..........................)

19 It's a gas that causes global warming and acid rain. (..........................)

4 Complete the following sentences:

1 Some forms of fuel, such as .... and ...., can be used in warming houses.

2 Extreme .... and .... are the factors needed for the formation of fossil fuel underground.

3 Water is considered a .... resource of energy, while oil is a .... resource of energy.

4 Turbines in electric power stations are turned by ...., and they produce kinetic energy to run the .... of the electric power stations.

5 The electric generator changes the .... energy into .... energy.

6 To avoid air pollution, we must use .... resources of energy.

7 Smog causes .... pollution.

8 Pesticides causes .... and .... pollution.

5 Complete the following using the words between the brackets:

(wood - deforestation - underground - oil)

1 Ancient people used .... in cooking food and warming.

2 Gasoline is made from ...., while coal is extracted from ....

3 Cutting trees with a fast rate causes ....



6 Choose from column (A) what suits it in column (B):



A

Column (A)	Column (B)
1 Chemical energy	a. is generated in electric power stations.
2 Kinetic energy	b. is stored inside fuel.
3 Thermal energy	c. is produced when the car wheels rotate.
4 Electrical energy	d. is produced when burning a piece of coal.

1 .... 2 .... 3 .... 4 ....

B

Column (A)	Column (B)
1 The Sun	a. takes a very long time to be formed.
2 Fossil fuel	b. takes a short time to be formed.
3 Biofuel	c. is the primary source of all kinds of energy.

1 .... 2 .... 3 ....

C

Column (A)	Column (B)
1 Liquid fuel	a. was used by ancient people.
2 Gasoline	b. is made from grass, corn, and wood chips.
3 Charcoal	c. is a fuel that is made from oil.
4 Wood	d. is made from wood.

1 .... 2 .... 3 .... 4 ....

D

Column (A)	Column (B)
1 Generators	a. produces thermal energy.
2 Turbines	b. produce electrical energy.
3 Burning fuel	c. is produced from heating water.
4 Steam	d. produce kinetic energy.

1 .... 2 .... 3 .... 4 ....

7 Cross out the odd word:

1. Wood – Oil – Corn – Charcoal (..................)
2. Sun – Wind – Water – Coal (..................)
3. Coal – Charcoal – Natural gas – Oil (..................)

8 Give reasons for:

1. The fuel (gasoline) pointer is very useful for drivers.

....

2. Fossil fuel is considered a nonrenewable resource of energy.

....

3. Biofuel is considered a renewable resource of energy.

....

4. Generators play an important role in electric power stations.

....

5. The fossil fuel amount on Earth is limited.

....

6. Engineers work on improving solar vehicles.

....

9 What happens if?

1. We burn a piece of coal?

....

2. We cut down trees at a faster rate than they can grow?

....

3. Oil is burned inside electric power stations?

....

4. Water is heated in electric power stations?

....

5. Acid rain falls on buildings?

....

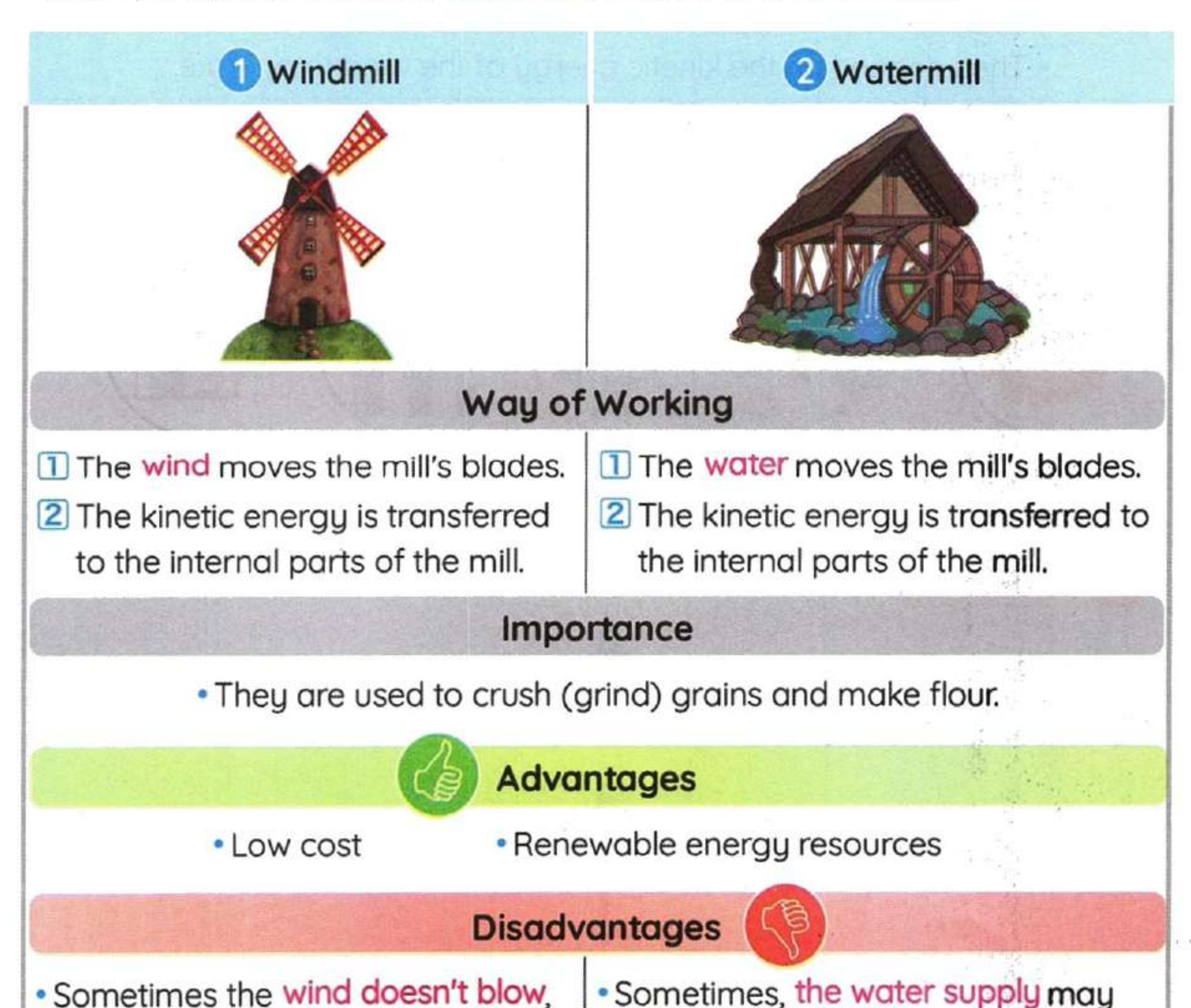
Concept 3 Renewable Energy Resources

1 Summary of Concept 3

Renewable resources of energy	They are natural resources that are replaced (renewed) at a faster rate than they are consumed.

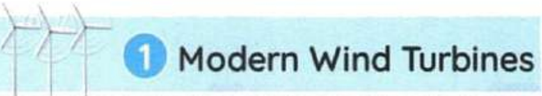
First: Wind Energy

- In the past, people needed machines to make their lives easier.



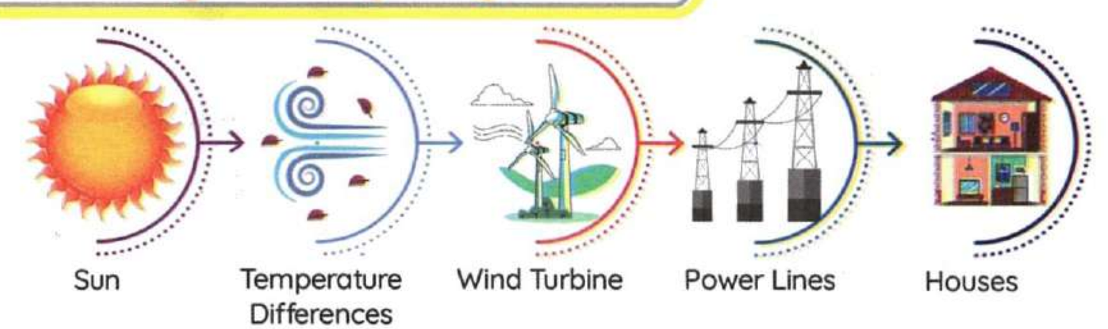
1 Windmill	2 Watermill
Way of Working	
1 The wind moves the mill's blades. 2 The kinetic energy is transferred to the internal parts of the mill.	1 The water moves the mill's blades. 2 The kinetic energy is transferred to the internal parts of the mill.
Importance	
• They are used to crush (grind) grains and make flour.	
Advantages	
• Low cost	• Renewable energy resources
Disadvantages	
• Sometimes the wind doesn't blow, so it can't do its main job.	• Sometimes, the water supply may dry up, so it can't do its main job.

Modern turbines are used now instead of old windmills.



1 Modern Wind Turbines	2 Old Windmill
Function	
• Generating electricity	• Grinding the grains to make flour
Differences	
• They are taller than windmills. • They have fewer blades than windmills. • The blades have no openings.	• They are shorter than wind turbines. • They have more blades than wind turbines. • The blades have openings.
Similarity	
• They depend on the kinetic energy of the wind to operate.	

Generating Electricity Using the Wind



1. **Solar energy** causes the air to move and the wind to blow.

⬇

2. The kinetic energy of the **wind** rotates the blades of the **wind turbines** that are used to spin the generators.

⬇

3. The **generators** change kinetic energy into electrical energy.

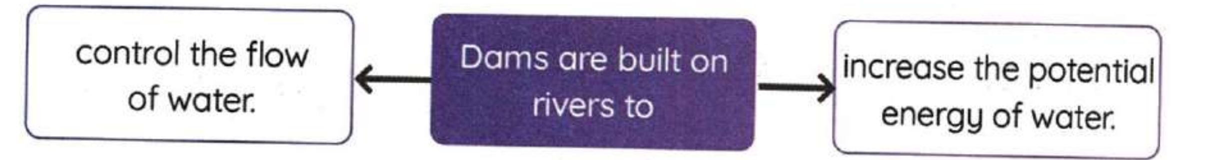
⬇

4. **Electricity** is transferred through big wires towards cities to light houses and streets.

Second: Water Energy

Hydroelectricity: (Hydroelectric energy)

- It is a type of electrical energy generated by water turbines in dams.



How can water be used to generate electricity 

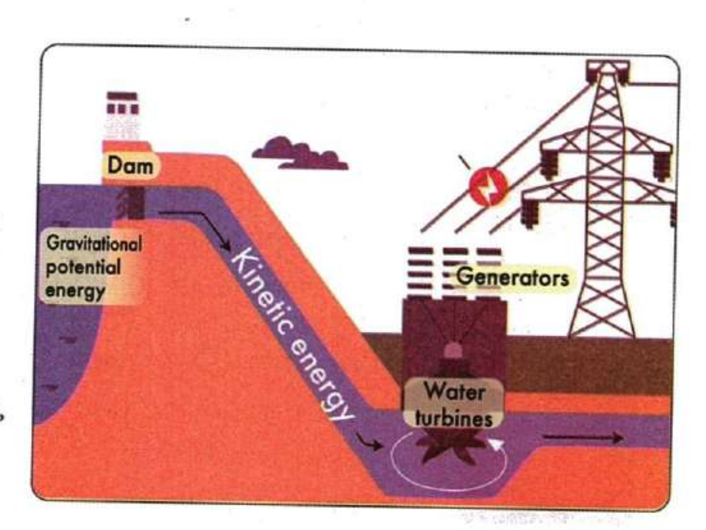
1. A hydroelectric dam holds back the flow of water to increase its potential energy.



2. When the water is released, it passes through the blades of turbines, so they rotate.



3. Turbines operate the generators, so kinetic energy is converted into electrical energy.



4. Electricity is transferred to cities through long electric wires.

P.O.C	1 Wind Turbines	2 Water Turbines
Differences	• They are placed in windy places.	• They are placed in places where dams are built on rivers.
Similarities	1 Both of them are **renewable resources**. 2 Both of them use **kinetic energy** to turn turbines. 3 Both of them are used to **generate electricity**.	

Third: Solar Energy

Sun

1. It is the main source of all kinds of energy on Earth.
2. The sunrays are called radiant energy (radiation).
3. The Sun provides us with light and heat.
4. The energy received from the Sun is called solar energy.

Uses of Solar Energy

- We can use solar energy as a source of thermal energy

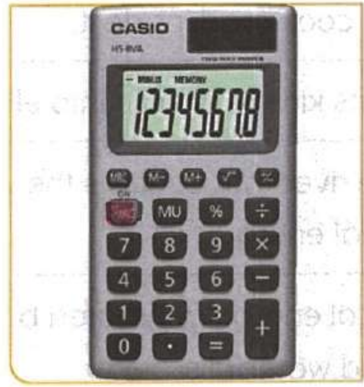
1 Greenhouses 	**Importance:** • They help farmers plant the crops that need warm climates. **How does it work?** 1 A greenhouse allows the entry of light and radiant energy from the Sun. 2 Radiant energy changes to thermal energy inside it. 3 Thermal energy warms the greenhouse from inside.
2 Warming	a Warming Ourselves • When exposing yourself to the Sun, you feel warm. b Warming Houses • By placing large windows on the wall that faces the sun.
3 Concave mirrors 	• They collect and focus the sunlight to heat a metal pot and cook the food inside.
4 Solar water heater 	**Structure:** It contains panels made of black pipes. **Location:** It can be placed on the roof of a house. **How does it work?** 1 As water passes through the pipes, it heats up. 2 Water can then be stored in a hot water tank to be used later.

Solar Panels

Structure	• They consist of a large number of small solar cells.
Idea	• Solar cells capture the radiant energy coming from the Sun and turn it directly into electricity.
Size	• Very small to supply only one light bulb with energy • Very large to supply buildings or cities with energy
Uses	Most solar panels are used to generate electricity to: 1 Light houses and streets. 2 Operate electric devices. 3 Recharge batteries of solar-cell calculators. 4 Power irrigation equipment in some villages.









2 Definitions of Concept 3

Renewable energy resources	They are energy resources that include wind energy and water energy.
Old windmill	It's a machine that used the kinetic energy of the wind to grind grains to make flour.
Watermill	It's a machine that used the kinetic energy of the water to grind grains to make flour.
Modern wind turbines	They use the kinetic energy of the wind to generate electricity.
Solar panels	They are composed of many solar cells. They absorb solar energy (sunlight) and convert it into electrical energy.
Greenhouse	It's a structure that helps farmers to plant crops that need warm climate.
Concave mirror	It's a mirror used to direct and focus sunrays toward the metallic pot used to cook food inside it.
Generator	It's a device that turns kinetic energy into electrical energy.
Dam	It's a building on the river that controls the water flow and increases its potential energy.
Hydroelectricity	It's a type of electrical energy generated by water turbines in dams and waterfalls.
Evaporation	It's a process in which water changes into water vapor.
Condensation	It's a process in which water vapor changes into water.

3 Give Reasons for... Concept 3

1. People use machines.
   - To make their life easier and do tasks faster.
2. Solar energy is a renewable resource of energy.
   - Because solar energy is the energy that will not run out as we use it.
3. People used windmills and watermills 400 years ago.
   - To grind grains to make flour.
4. People now use modern wind turbines.
   - To generate the electricity needed to light houses and operate different devices.
5. Using windmills and watermills has a lot of advantages.
   - Due to their low cost and because they depend on renewable resources.
6. Using windmills and watermills has great disadvantages.
   - Sometimes the wind does not blow or the water supply may dry up.
7. We feel the warmth of the Sun at night.
   - Because the atmosphere, water and soil absorb heat energy from the Sun.
8. Greenhouses help farmers in the agricultural field.
   - Because they help farmers in planting crops that need warm weather.
9. We place large windows on the wall that faces the Sun.
   - To enable the energy of the Sun to warm the house.
10. Concave mirrors are used in cooking.
    - To direct the sunrays towards the cooking pans to cook food inside them.
11. The panels made of black pipes can be placed on the houses' roofs.
    - To heat water, then store it in a hot water tank.
12. Solar panels are used in generating electricity for lighting houses and streets.
    - Because they convert solar energy into electrical energy.
13. The Sun is the main source in generating electricity from windmills.
    - Because the Sun warms the Earth and the wind. Different parts of the world get different amounts of solar energy. This causes the blowing wind to rotate the blades of the windmills.

14 Dams are built on rivers.

- To control the flow of water and increase the gravitational potential energy of water to generate electricity.

15 Water returns to rivers after flowing.

- Because water evaporates, then it condensates in the form of clouds and returns to the rivers in the form of rain.

16 Renewable resources of energy are considered clean resources of energy.

- Because they don't need burning fossil fuel to generate electricity, so they don't pollute the environment.

17 There are conditions required for wind turbines to work with high efficiency.

- Because they should exist in windy regions.

4 What Happens if...? Concept 3

1 Wind doesn't blow in an area that contains many wind turbines.

- The wind turbines will not move, so they can't generate electricity.

2 Water falls on the blades of water turbines.

- The blades will rotate, so they can generate electricity.

3 The force of wind increases in an area that contains many wind turbines.

- The blades rotate faster, and the efficiency of the wind turbines increases.

4 Sunlight falls on a greenhouse.

- Radiant energy changes to thermal energy inside the greenhouse which warms the greenhouse from inside.

5 Sunlight falls on a concave mirror.

- The concave mirror focuses the sunlight on the cooking pot to cook food inside it.

6 Sunlight falls on a solar-cell calculator.

- It changes solar energy to electrical energy to charge its batteries.

7 Water is released from a dam.

- The gravitational energy of water changes into kinetic energy to rotate the water turbines and generate electricity.

5 Revision on Concept 3

1 Choose the correct answer:

1. All the following are considered renewable resources of energy, except ....
   a. wind b. coal c. the Sun d. water
2. The main function of .... is grinding the grains and making flour.
   a. modern turbines b. solar panels
   c. dams d. watermills
3. Both modern wind turbines and old windmills are similar in their........ .
   a. blades number b. ways of working
   c. heights d. blades shape
4. Modern turbines are .... than old windmills.
   a. longer b. shorter c. heavier d. slower
5. The source of all energies on Earth is ....
   a. wind b. the moon c. the Sun d. water
6. In winter, greenhouses help farmers grow plants that need ....
   a. warm weather b. cold weather
   c. less water d. less sunlight
7. Solar panels can be used operate all the following, except ....
   a. a calculator b. a gas oven
   c. irrigation equipments d. street lights
8. The .... energy of the Sun causes air movements and wind blowing.
   a. chemical b. radiant c. electrical d. sound
9. The electricity from wind turbines is transmitted into houses and factories through ....
   a. the wind b. devices c. generators d. wires
10. Hydroelectric power is produced using ....
    a. air b. water c. soil d. plants
11. Water of rivers stores great .... energy at the top of the waterfalls.
    a. kinetic b. potential c. electrical d. light
12. The power source for the electric fan is ....
    a. wind b. water c. heat d. electricity

2 Put (✓) or (✗):

1. Windmills can do their job all the time, as the wind never stops blowing. ( )
2. When the kinetic energy of the wind increases, the windmill blades spin faster. ( )
3. Both modern wind turbines and old windmills are used to generate electricity. ( )
4. Electricity generated by wind turbines is transmitted through the wind. ( )
5. The power source for the electric fan is wind. ( )
6. Wind turbines convert kinetic energy into electrical energy. ( )
7. We use solar energy to preserve food. ( )
8. We feel the warmth of the Sun during the day only. ( )
9. A solar cell consists of a large number of small solar panels. ( )
10. A calculator's output energy is solar energy. ( )
11. Small solar panels may be able to light buildings. ( )
12. The flow of water in dams can be controlled to generate electricity. ( )
13. Electricity generated from water is called hydroelectricity. ( )
14. Rivers store kinetic energy. ( )
15. The electricity produced by water is known as electromagnetic energy. ( )

3 Write the scientific term:

1. They are energy resources that include wind energy and water energy. (..................)
2. They are used to collect and focus sunrays towards the cooking pots. (..................)
3. It's a device that the wind rotates its blades to generate electricity. (..................)
4. It's a device that consists of black pipes used to heat water. (..................)
5. It's the device in an electric power station that turns kinetic energy into electrical energy. (..................)

6 It's a structure on the river that controls the flow of water and increases the potential energy of water. (..........)

7 It's a type of electrical energy generated by water turbines in dams. (..........)

4 Complete the following sentences:

1 When the wind turbines rotate, ... energy is converted into .... energy.

2 Both wind and water movements produce .... energy, which is used to rotate turbines to generate .... energy.

3 The number of blades in modern wind turbines is .... than in old windmills.

4 We can use solar energy in cooking using concave ...., which collect and focus the .... onto the metal pots to heat them.

5 .... help farmers grow crops that need warm weather.

6 Solar energy causes the air to .... and the wind to ....

7 Electricity is transferred to cities through ....

5 Choose from column (A) what suits it in column (B):

Column (A)	Column (B)
1 Greenhouses	a. are used in heating water.
2 Concave mirrors	b. are used in planting some kinds of crops.
3 Panels of black pipes	c. are used in cooking food.

1 .... 2 .... 3 ....

6 Study the following figures, then complete the sentences below:

Figure (1)	Figure (2)

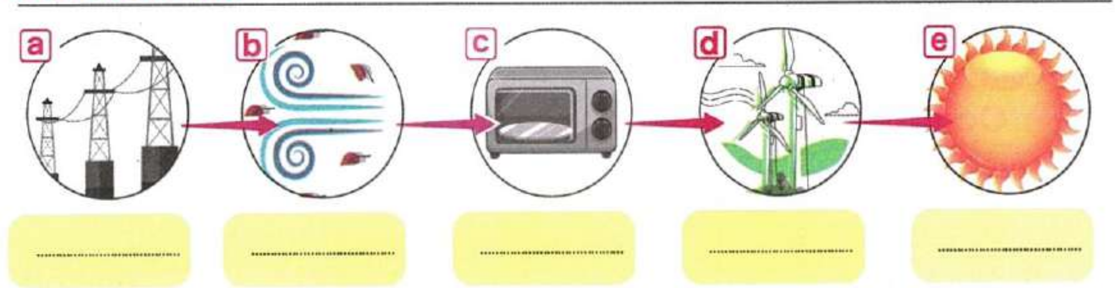
1 Figure (..........) is used to grind grains.

2 The machine in figure (..........) is shorter than the machine in figure (..........).

3 Both of them are similar in ....

4 Both of them depend on ....

7 To generate electricity, arrange the following figures from start to end:



....

8 Give reasons for:

1. People used windmills and watermills 400 years ago.

....

2. People now use modern wind turbines.

....

3. You feel the warmth of the Sun at night.

....

4. Greenhouses are very important to farmers.

....

5. Generators have an important role in electric power stations.

....

6. Dams are built on rivers.

....

9 What happens if?

1. Wind doesn't blow in an area that has wind turbines?

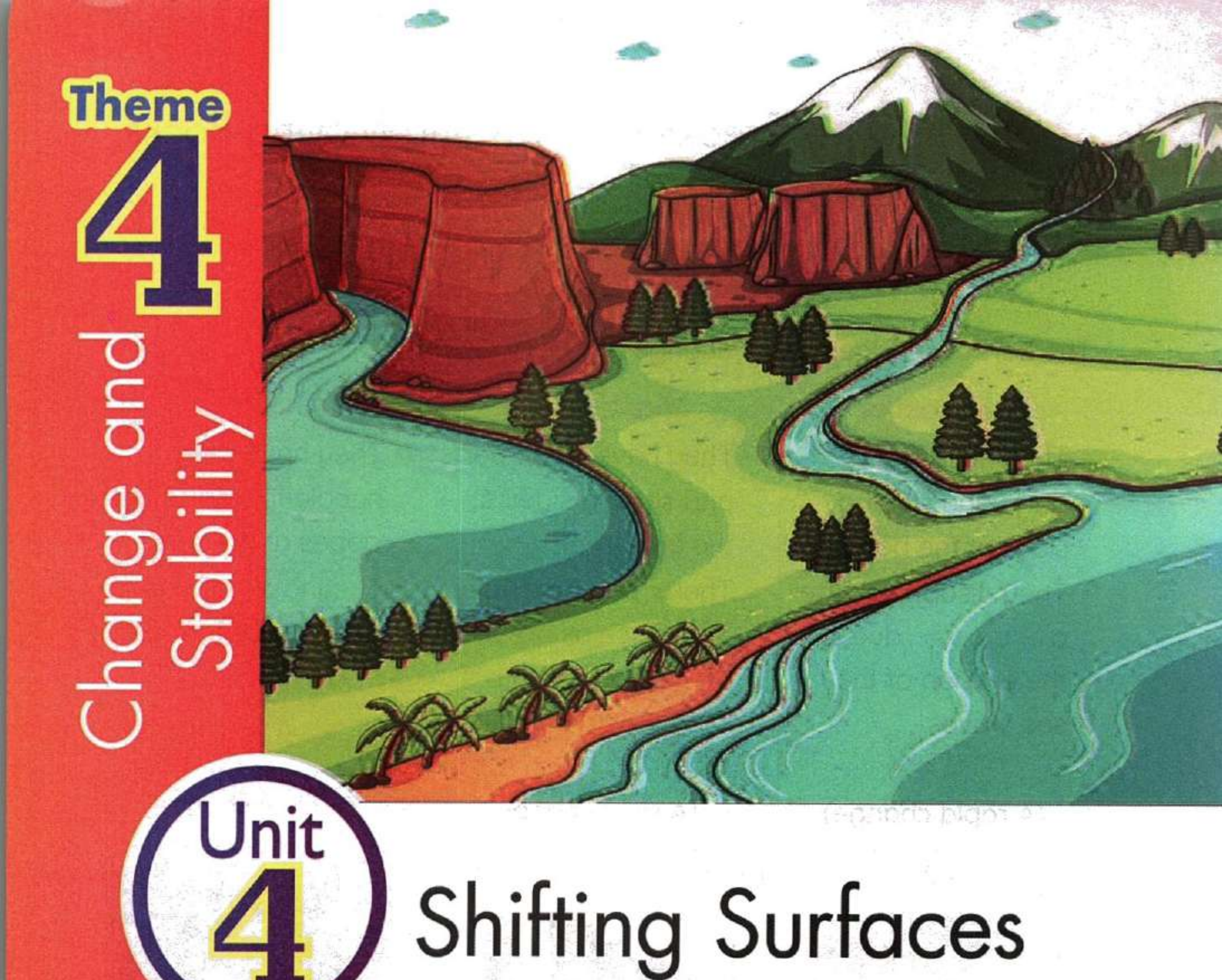
....

2. The kinetic energy that is applied on the wind turbines increases?

....

3. The water of dams becomes free?

....



Theme 4

Change and Stability

Unit 4 Shifting Surfaces

Unit Concepts:

- Concept 1 Breaking Down and Moving Rocks
- Concept 2 Changing Landscapes

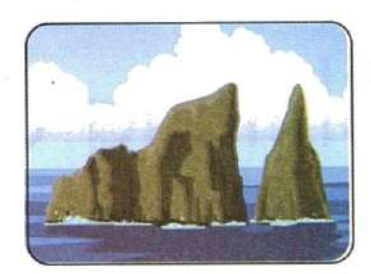
Concept 1 Breaking Down and Moving Rocks

1 Summary of Concept 1

- The Earth's surface always changes.

Sandcastles	Coastal rocks	Canyons
• They have steep parts and sloping sides at the bottoms. • They disappear after a short time due to the erosion of the sea waves.	• They have steep parts and sloping sides at the bottoms. • There may be a little difference as breaking off some parts by wind or water after many years.	• They have steep needle-like parts with slopes at the sides. • They take millions of years to be formed.
(A rapid change)	(A slow change)	(A slow change)





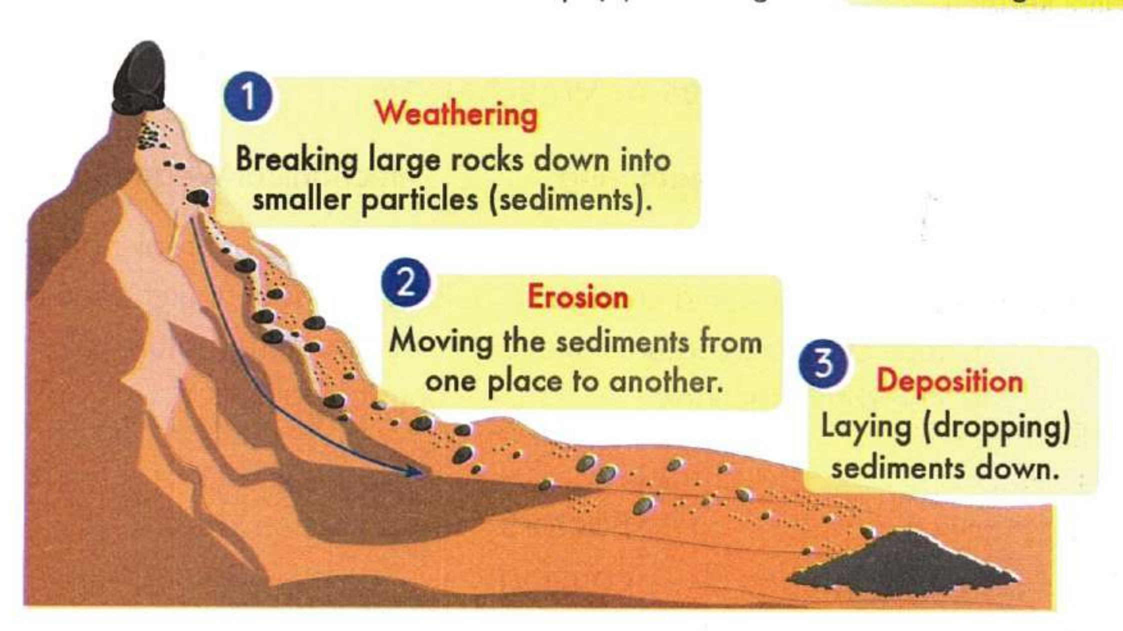


Canyon:
- has steep needle-like parts
- is formed due to slow changes
- is created by water
- has inclined sides at bottom

Shaping the Earth's surface

- Wind, water, and weather conditions are the factors that cause changes of the Earth's surface.
- Earth's surface changes through three processes which are weathering, erosion, and deposition.

1 Weathering → 2 Erosion → 3 Deposition





1 Weathering:

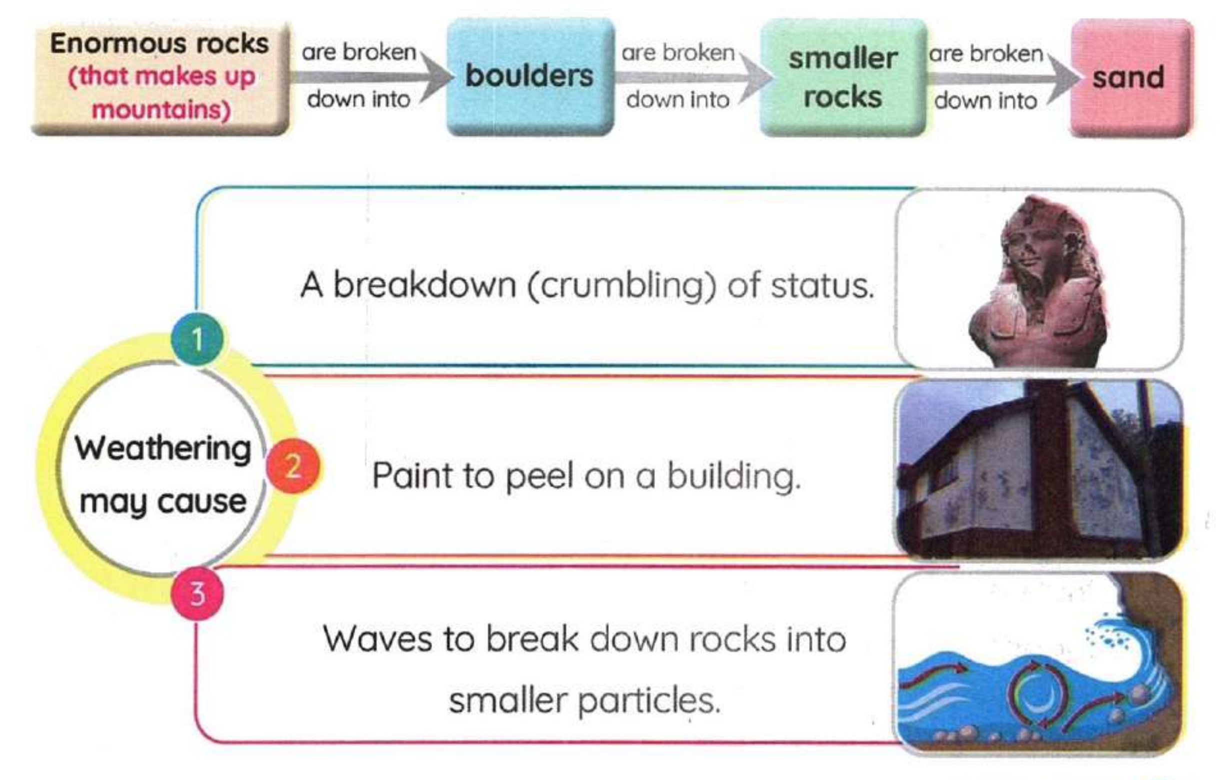


- The changing of the Earth's surface begins with the **weathering process**.

Weathering

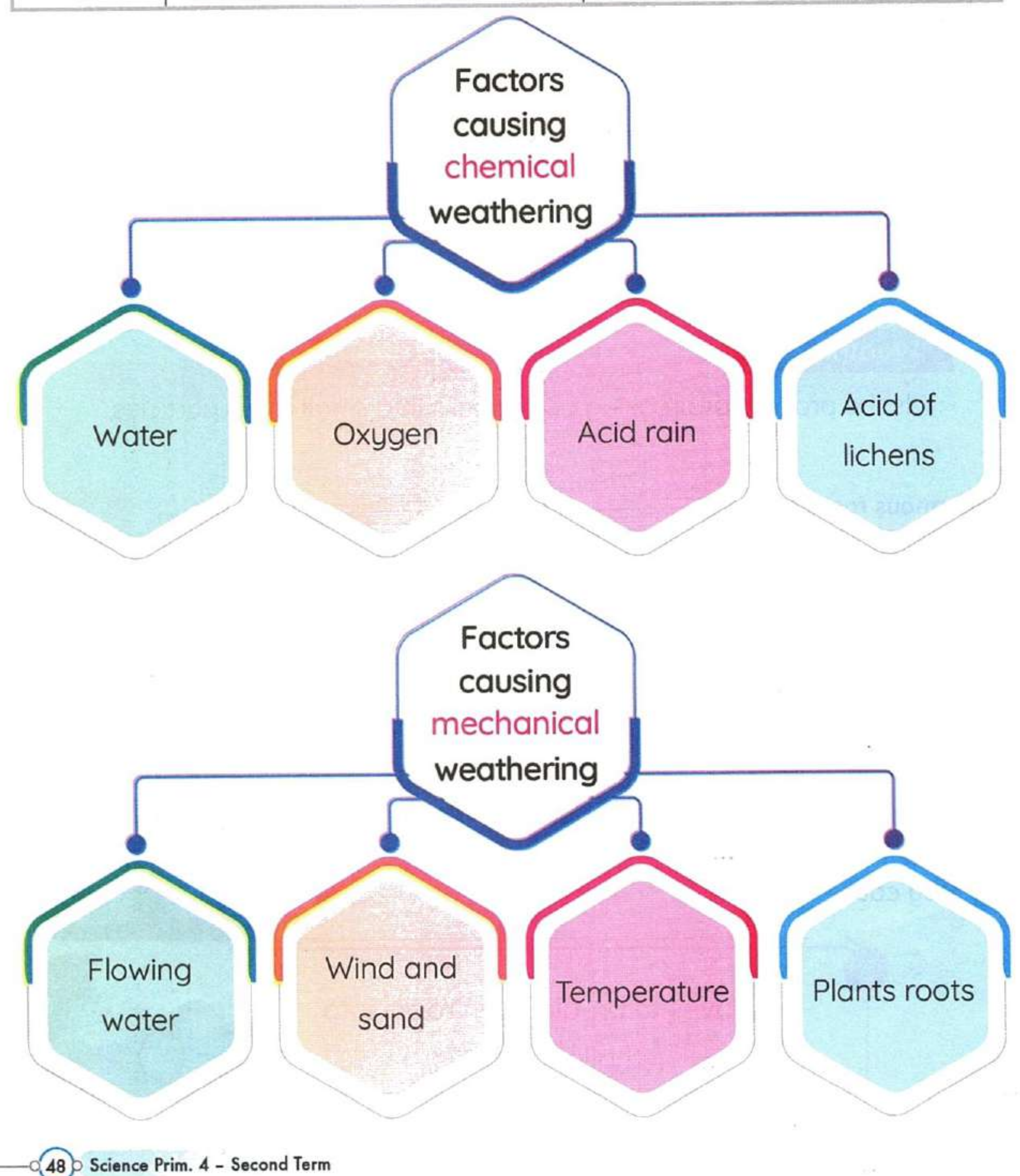
Is the process of breaking down rocks into small (tiny) particles.

Enormous rocks (that makes up mountains) → are broken down into → **boulders** → are broken down into → **smaller rocks** → are broken down into → **sand**

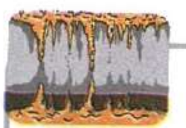


Types of Weathering

P.O.C	Chemical Weathering	Mechanical Weathering
Definition	• The process of breaking rocks down with a change in their structure (nature) due to chemical reactions.	• The process of breaking rocks down without any change in their structure (nature) due to physical factors.



Factors causing chemical weathering



1 Water

- Water dissolves minerals in the rocks, and then those **dissolved minerals** recombine again, forming new shapes, as in **limestone caves**.



2 Oxygen

- **Oxygen** in the air reacts with the **iron** in some rocks, forming **red-colored rust** that causes rocks to be weak and easily broken.



3 Acid rain

- Acid rain falls on rocks.
- These acids dissolve minerals in the rocks, so they become weaker and break down easily.

4 Acid of lichens

- Lichens produce acids on rocks.
- These acids dissolve minerals in the rocks, so they become weaker and break down easily.

Factors causing mechanical weathering



1 Flowing water

- Flowing water carrying some sand and gravel causes:

a. Scouring edges off boulders.
b. Breaking off large pieces of tumbled rocks due to collision with each other.



2 Plants roots

a. Plant roots grow inside the cracks of rocks.
b. Cracks become wider.
c. Rocks are broken down.



3 Wind and sand

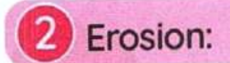
a. Wind rushes sand on the rock surface.
b. Friction occurs between sand and rocks.
c. This causes the smoothing of rocks and the breaking down of them.



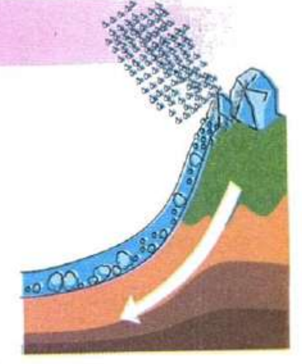
4 Temperature

a. Water flows in the tiny cracks in the rocks.
b. Water expands when it turns into ice, then melts.
c. By repeated melting and freezing of water, cracks in rocks become wider, causing the rocks to be broken down.





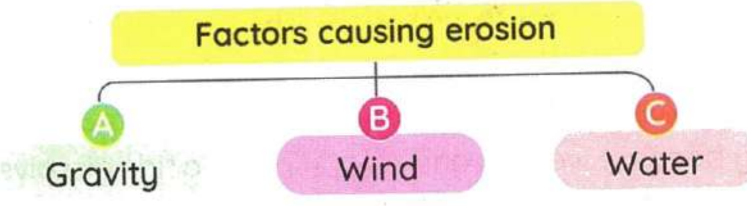
2 Erosion:



Erosion

It is the process of moving sediments from one place to another.

- **Note:** Sediments are weathered sand, soil, and small rocks.



Factors causing erosion

A Gravity



- Gravity pulls rocks down mountainsides.

B Wind



- The wind carries grains of sand from one place to another, where:
  - Strong wind and hurricanes blow sand for long distances.
  - Gentle wind blows sand grains for short distances.

C Water



- **Rivers** and **floods** erode rocks and soil from their banks.
- **Waves** pull sand away from beaches.
- **Rain** washes the soil on hilly farmland downhills.

3 Deposition:

Deposition

It is the process of laying down eroded sediments in a new place.

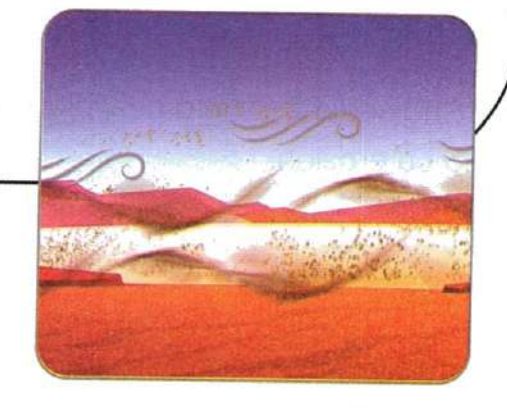
1 Deposition by wind:

- As the wind blows, it picks up sand.
- Wind carries sand to another place.
- When the wind stops blowing, sand is deposited.

This forms:

a) Small sand dunes on beaches.

b) Large sand dunes in desert.



2 Deposition by water:

- A river carries sediment eroded from its banks.
- When the river carrying sediments meets a sea, it deposits them.

This forms:

- A delta, such as Nile Delta



2 Definitions of Concept 1

Weathering	It is the process of breaking down rocks into smaller pieces.
Mechanical weathering	It is a type of weathering that breaks off rocks without changing its matter(structure).
Chemical weathering	It is a type of weathering that leads to the formation of a different material.
Lichens	They are tiny-like plants that live on rocks and produce acid on them, causing them to break down.
Oxygen gas	It is the gas that reacts with iron in rocks, forming a red-colored rust on some rocks.
Plant's roots	They are a part of the plant that grows in rocks' cracks, causing them to be broken.
Acid rain	It is a natural phenomenon that has the same effect as lichens on rocks.
Erosion	It is the process of moving sediment from one place to another.
Deposition	It is the process of settling sediments in a new place after they have been moved by erosion.
Gravity	It is an eroding factor that pulls the rocks down mountainsides.
River	It is an eroding factor that moves rocks from their banks downstream.
Sediments	They are pieces of weathered rocks that are moved by gravity, wind, water, or other factors.

3 Give Reasons for... Concept 1

1 The Earth's surface is always changing.
- Because of many factors, such as wind, water, and weather.

2 Wind is the main factor changing the Earth's surface.
- Because it can break down rocks and move small rocks to another place.

3 Waves are from factors which can change landforms.
- Because waves can move small parts of sand from one place to another.

4 Changes to the Earth's surface are different in the time of happening.
- Because some changes of the Earth surface happen quickly, such as the disappearance of sandcastles, while others take a very long time, such as formation of canyons.

5 The shape of coastal rocks changes after many years.
- Because some parts of them may be broken off by water or wind.

6 The main source of soil is big rocks.
- Because when the weathering process occurs, the big rocks break down into tiny rocks, then into pebbles or grains of sand.

7 Oxygen gas has a bad effect on rocks.
- Because oxygen gas can react with iron in rocks forming red-colored rust which makes the rock weaker and breaks down easily.

8 Plant roots may have a bad impact on rocks.
- Because as plant roots grow inside rocks, the cracks in the rocks become wider, so the rocks break down.

9 Lichens have a bad impact on rocks.
- Because they produce acids as they grow on rocks that make the rock weaker and break off easily.

10 There are some similarities between the effects of lichens and acid rain on rocks.
- Both of them can dissolve the rocks or changing their nature.

11 Sand and wind team up to wear down large rocks.
- Because wind rushes sand on the surface of the rocks, it smoothes and breaks them down.

12 It is hard to see weathering in action (in most cases).
- Because it takes a long period of time to happen.

13. Chemical weathering causes a greater change to rocks than mechanical weathering.
    - Because chemical weathering forms completely new, different matter, while mechanical weathering breaks down rocks only.
14. Sometimes you can see erosion happening.
    - Because sometimes we can see flash floods, hurricanes, or landslides.
15. Gravity is one of the eroding factors.
    - Because gravity pulls rocks down mountainsides.
16. Erosion and deposition are linked processes.
    - Because eroded rocks must be deposited over time.
17. The formation of a delta.
    - As a result of the deposition process when a river meets a sea.

4 What Happens if...? Concept 1

1. The waves hit a sandcastle?
   - The sandcastle will be gone (disappeared).
2. Water runs over rocks?
   - Water will dissolve some minerals in rocks.
3. Oxygen in our atmosphere reacts with iron in the rock?
   - A red-colored rust will be formed, so rocks are broken down more easily.
4. The continuous melting and freezing cycle of water inside rocks cracks?
   - Water expands, causing the cracks in the rocks to become wider, so the rocks break off.
5. Acid rain falls on rocks?
   - Acid rain will dissolve the minerals in rocks, so they become weaker and break down easily.
6. Lichens grow on the rocks?
   - They produce acids that can break off rocks.
7. A plant's root grows inside rocks?
   - The cracks become wider so rocks break down easily.
8. Rain falls on a hilly farmland?
   - Rain will carry the weathered rocks and soil on farmlands.
9. Wind stops blowing (concerning the process happening to sand)?
   - The deposition process will happen.
10. A river carrying sediments meets a sea?
    - The deposition process happens and a delta may be formed.

5 Revision on Concept 1

1 Choose the correct answer:

1. Steep valleys formed due to flowing water erosion are called ....
   a. hills b. sand dunes c. canyons d. deltas
2. A canyon may take .... to be formed.
   a. minutes b. hours c. days d. years
3. All the following are reasons for chemical weathering, except ....
   a. water b. plant roots c. acid rain d. oxygen gas
4. .... may cause chemical or mechanical weathering.
   a. Lichens b. Oxygen c. Water d. Rocks
5. Which of the following examples represents mechanical weathering?
   a. Red-colored rust on rocks b. Acid rain falls on rocks.
   c. Roots grow inside rocks. d. Water dissolves minerals.
6. Sand is formed due to the breaking down of ....
   a. wood b. plastic c. glass d. rocks
7. Limestone caves are formed due to the combination of ....
   a. dissolved minerals b. insoluble minerals
   c. red-colored rust d. acid rain
8. .... is the process by which sediments are carried to another place.
   a. Deposition b. Erosion c. Weathering d. Melting
9. Dissolving minerals from rocks to recombine with new substances is an example of ....
   a. mechanical weathering b. weathering by wind
   c. chemical weathering c. erosion
10. All the following are processes that change the Earth's surface, except ....
    a. erosion b. digestion c. weathering d. deposition
11. Lichens produce .... that dissolve(s) minerals found in rocks.
    a. oxygen b. rain c. water d. acids

12 The process of breaking down rocks on the Earth's surface is called ....

a. erosion b. weathering c. decomposition d. deposition

13 The force of .... pulls rocks from the top of the mountain to its bottom.

a. river water b. seawater c. rainwater d. gravity

14 .... erode(s) rocks and soil from their banks.

a. Rivers b. Mountains c. Rainwater d. Gravity

15 When a river carrying sediments meets a sea, a .... is formed.

a. sand bar b. sand dune c. delta d. sand pile

16 Gentle wind can carry sand grains for .... distances.

a. short b. long c. huge d. very long

2 Put (✓) or (✗):

1 The Earth's surface changes from time to time. ( )

2 All changes to the Earth's surface take hundreds of years. ( )

3 Canyons take millions of years to be formed. ( )

4 The Earth's surface never changes. ( )

5 The deposition process takes place before the erosion process. ( )

6 We can see weathering in action everywhere around us. ( )

7 Plant roots help in the formation of rocks. ( )

8 Rocks become stronger when iron found in them rusts. ( )

9 Wind is one of the agents that cause weathering. ( )

10 Chemical weathering causes greater changes to rocks than mechanical weathering. ( )

11 Sometimes you can see erosion happening. ( )

12 The deposition process never changes the shape of the Earth's surface. ( )

13 The formation of sand dunes in the Eastern Desert in Egypt is due to the movement of the wind. ( )

14 Floods are one of the factors that cause water erosion. ( )

15 The erosion process is usually followed by the weathering process. ( )

3 Write the scientific term:

1. They are deep valleys carved by the flowing water. (..................)
2. It's the process of moving rocks from one place to another. (..................)
3. It's the process of laying sediments down. (..................)
4. It's the kind of weathering that changes the structure and color of rocks. (..................)
5. They are tiny, like plants, that live on rocks and produce acids on them. (..................)
6. It is the gas that causes the red-colored rust on some rocks. (..................)
7. It is a type of weathering that occurs in rocks and leads to the formation of a completely different material. (..................)
8. It is a type of weathering that breaks rocks down without changing their matter. (..................)
9. It is an eroding factor that pulls rocks down mountainsides. (..................)
10. It is an eroding factor that moves rocks from their banks downstream. (..................)
11. It is the process that lays sand down when the wind stops blowing. (..................)
12. It is a landform of deposited sediments formed when a river meets a sea. (..................)

4 Complete the following using the words between the brackets:

A (Mechanical - Acid rain - chemical - oxygen - Acids - iron - plant roots)

1. The melting and freezing cycles of water have the same effect as ...., as they make the cracks in the rocks wider.
2. .... produced by lichens may dissolve rocks.
3. .... has the same effect of lichens on rocks.
4. .... weathering and .... weathering are types of weathering.
5. When the .... in air reacts with .... in rocks, a red-colored rust is formed.

B (water - Nile Delta - hurricane - deposition - gentle wind - Egyptian Western Desert)

1. A .... forms a small sand dune, while a .... forms large sand dunes like that in the ....
2. .... is a fan-shaped mass of mud and sediments.
3. Wind, ..., and gravity are natural factors that control erosion process.
4. The process of laying down sediment after its erosion is called ....

5 Choose from column (A) what suits it in column (B):

Column (A)	Column (B)
1 Lichens	a. causes mechanical weathering of rocks.
2 Water	b. causes the red-colored rust on a toy car.
3 Oxygen	c. produce acids as they grow on rocks.
4 Melting and freezing	d. may cause both types of weathering.

1 .... 2 .... 3 .... 4 ....

6 Study the following figures, then complete the following sentences:

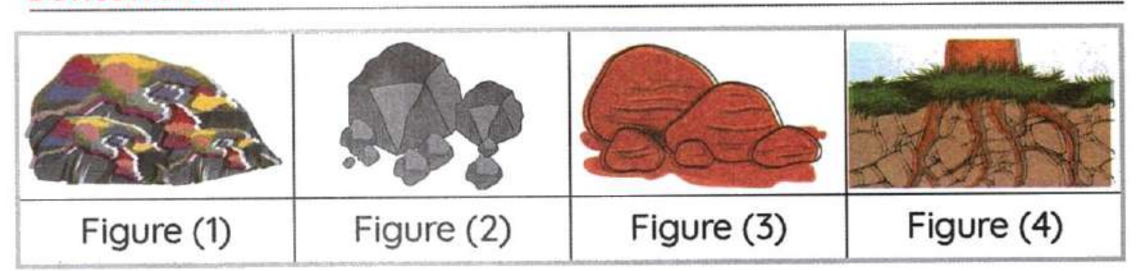


Figure (1) | Figure (2) | Figure (3) | Figure (4)

1. Figure (..........) represents a living organism that causes mechanical weathering.
2. Figure (..........) represents a living organism that causes chemical weathering.
3. Oxygen gas has a bad effect on rocks in figure (..........).

7 Give reasons for:

1. The Earth's surface is always changing.

   ....

2. Oxygen in the atmosphere has a bad effect on some rocks.

   ....

3. Lichens dissolve rocks as they grow.

   ....

4. Chemical weathering causes greater changes to the rocks.

   ....

5. Erosion and deposition are linked processes.

   ....

8 What happens if?

1. Oxygen gas reacts with iron rocks, forming a red-colored rust?

   ....

2. Acid rain falls on rocks?

   ....

3. The lichens that grow on rocks produce acids?

   ....

4. Plant roots grow inside rocks' cracks?

   ....

Concept 2 Changing Landscapes

1 Summary of Concept 2

- Many factors can change the Earth's surface and form new landforms, such as:


Canyon


Sand Dune


Valley


Delta



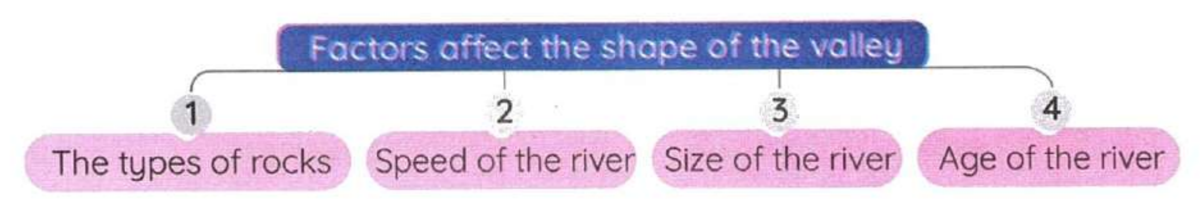
1 Canyons:

They are special types of valleys carved by flowing water.

Processes	Weathering and erosion
Factors	Water, wind, and other factors
Age	Canyons take millions of years to be formed.
Properties	• The sides are steep. • Walls are narrow and vertical. • They usually consist of many layers.

How are canyons formed?

1. Gravity pulls rainwater downhill, forming small streams.
2. Small streams are joined together to form a bigger stream (river).
3. The water of the river moves fast and erodes rocks in its pathway.
4. When a river dries after a very long time, a canyon may be formed.



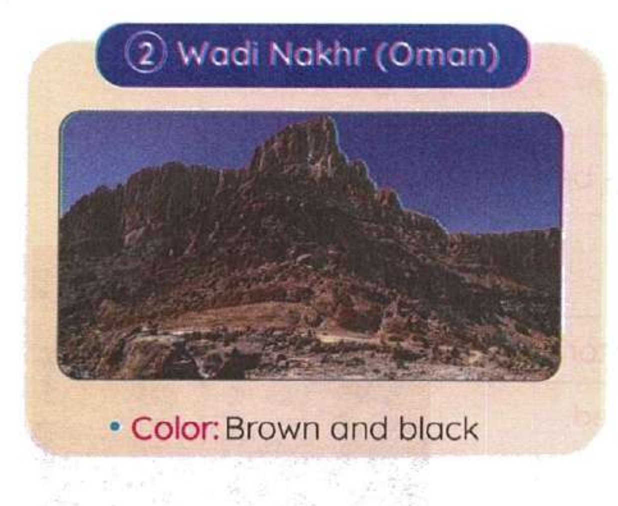
Examples of canyons and their properties

① The Grand Canyon

- The Grand Canyon is the largest canyon in the world.

Location	United States of America
Age	It is millions of years old.
Shape	• It is very large and steep. • It contains many layers of rocks. • There is a river at the bottom.

② Wadi Nakhr (Oman)



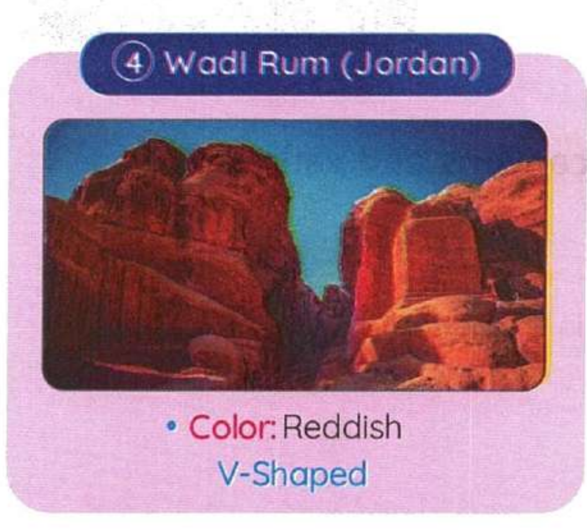
- Color: Brown and black

③ Small Canyons (Thiland)



- Color: Reddish

④ Wadi Rum (Jordan)



- Color: Reddish
  V-Shaped

⑤ Colored Canyon (Sinai)



- Color: Reddish
  V-Shaped

- **When water is moving over the sand,**
  it pushes some of the sand away and leaves an impression.



- **Small canyon:**

How is it formed?	A stream of water may have formed it.
What is your evidence?	• There are trees and plants on both sides. • The sides are gently sloped
What happens if it rains a lot on it?	It will become deeper.

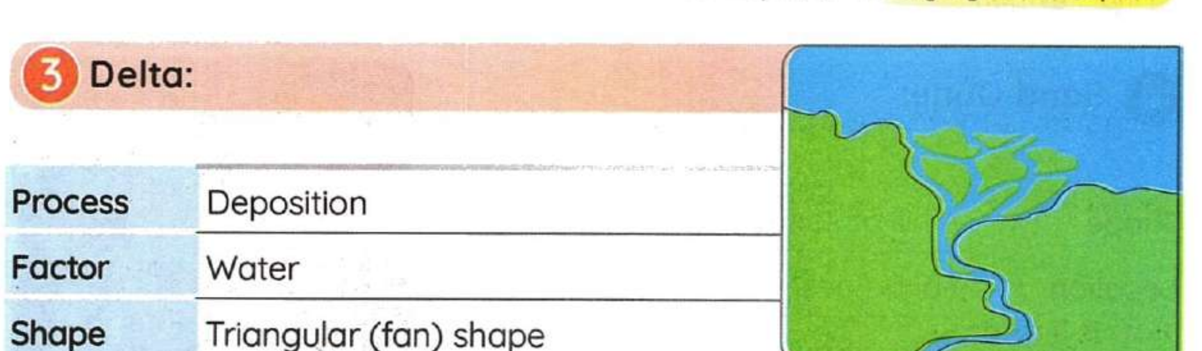
2 Valleys:

They are lowland areas between mountains.

Processes	**Weathering** and **erosion**
Factors	**Water**, **wind**, and **other factors**.
Properties	• The sides are **gently sloped**. • They are usually surrounded by a **wide**, **flat plain**.

Similarities between canyons and valleys

- They are formed by rivers or streams.
- They often have rivers or streams flow in the bottom.



3 Delta:

Process	Deposition
Factor	Water
Shape	Triangular (fan) shape

How is delta formed?


1. Fast-moving rivers carry sediments called silt


2. The water of the river is full of sediment that has been collected along the journey.

Silt is made up of very fine bits of sand, clay or rock materials


3. When the rapid flowing water "of the river" enters still water "lake", or slower water "ocean or sea", water loses energy and drops the sediment that it is carrying, forming a delta

- The wetland of plants in the delta helps in increasing deposition

Because they are responsible for slowing down the water in the river.

The Nile River Delta

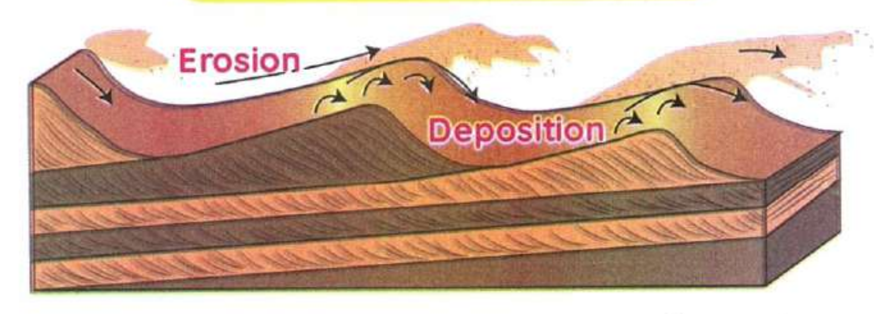
"The most famous delta in the world".

Area	It covers over 20,000 km² in Egypt.
Location	Lies between Cairo and the Northern coast of Egypt.
Importance	It is characterized by the presence of fertile soil that allows the cultivation of different types of crops.

4 Sand Dune:

Shape	A hill of sand
Location	Sandy desert or sandy beach
Area	• They are found in groups. • They may cover a large area. (Hundreds of meters tall).
Processes	Erosion and deposition
Factors	Wind-blown sand
How they are formed?	Sand dunes are formed when a barrier like a rock blocks the wind-blown sand.

Sand Dunes Movements

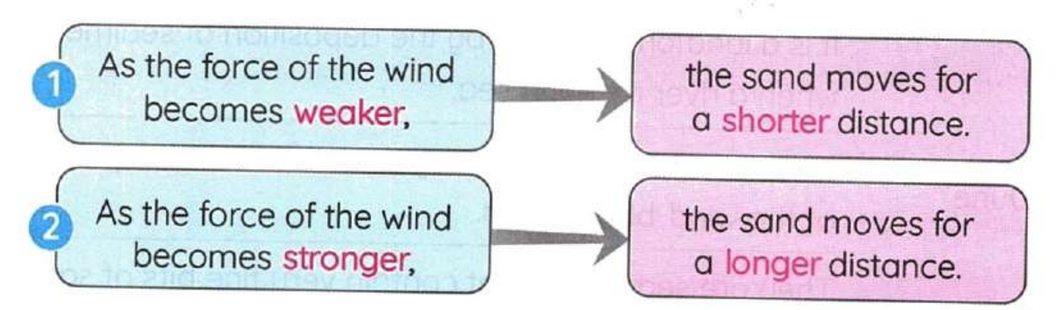


- Dunes are interesting because they are constantly moving, as follows:

1. When wind blows across a dune, it erodes away the sand grains from the side it blows.
2. The grains of sand are carried up by the wind along the slope of the dune.
3. When they reach the top, the dune forms a barrier to the wind. So, the sand grains roll down the other side.

Wind Erosion

- The wind in the desert can be a powerful force of change.
- Wind and sand work together to erode rocks.
- The distance that the sand grains move depends on the force of the wind.



- The way the sand moves depends on the direction of the wind.

Steps of Erosion by Wind

1. **When wind blows across the land,** it picks up sand and other rock particles and carries them along.
2. **When this flying sediment hits a rock,** it wears down that rock like a sandblaster.
3. **This process carves the rock into strange shapes.**

Recognizing signs of weathering, erosion, and deposition is very useful.

Because it helps us build houses in safe places, where:

1. People must not build a house on a hill that is eroding.
2. People must not build a house very close to a river.



2 Definitions of Concept 2

Valleys	They are lowland areas between mountains.
Canyons	They are special types of valleys with steep sides.
Delta	It is a landform formed by the deposition of sediments when a river meets a sea.
Sand Dune	It is a hill of sand created by the erosion and deposition of the wind-blown sand.
Slits	They are sediments that contain very fine bits of sand, clay, or rock materials.

3 Give Reasons for... Concept 2

1. You must avoid building a house on a hill and exposing it to erosion.
   - Because the river may change its path and cause erosion and deposition of the house.
2. There are similarities between valleys and canyons.
   - Because both of them were formed by flowing water.
   - Because they may have rivers or streams flowing through their bottoms.
3. A delta is formed when flowing water enters still water.
   - Due to the deposition process, as water loses energy and drops its sediments forming a delta.
4. The roots of plants increase the deposition of rivers' sediments.
   - Because the roots of plants slow down the water movement, which increases the rate of the deposition process.
5. Delta allows the cultivation of different types of crops.
   - Because it has fertile soil.
6. Sand dunes are constantly moving.
   - Due to the force of the wind.

4 What Happens if...? Concept 2

1. Streams of water flow over flat land?
   - They may form small canyons where they flow.
2. It rains a lot in a small canyon?
   - This small canyon will get deeper.
3. Small streams of water join together?
   - It will form a river, which causes more erosion.
4. The wind blows across a sand dune?
   - Sand grains are eroded away from the side of the wind coming from.
5. Wind-blown sand hits a big rock?
   - Sand is deposited, forming a sand dune.
6. The force of the wind carrying sand increases?
   - Wind will move sand grains for a longer distance.
7. The direction of the wind changes?
   - The way the sand moves changes.

5 Revision on Concept 2

1 Choose the correct answer:

1. A canyon may take .... of years to be formed.
   a. hundreds b. tens c. millions d. couple
2. Canyons can be formed in many ways, including ....
   a. weathering only
   b. erosion only
   c. weathering and erosion
   d. erosion and deposition
3. If the rain falls over a canyon several times per year, ...
   a. its depth increases
   b. its depth decreases
   c. it becomes flat
   d. not be affected
4. The shape of a rock gets worn and rounded by the effect of the .... process.
   a. weathering d. deposition c. erosion d. photosynthesis
5. .... is/are evidence of deposition.
   a. A rounded, worn rock
   b. A patch of sand on the ground
   c. An area with canyons
   d. Red-colored rocks
6. A river may make a new .... at its end through the .... process.
   a. mountain, deposition
   b. canyon, erosion
   c. land, deposition
   d. land, weathering
7. .... pulls rainwater downhill, forming small streams.
   a. Magnetism b. Gravity c. Sunlight d. Wind
8. All the following factors affect the shape of the valley, except ....
   a. the river's size
   b. the river's speed
   c. the rocks' type
   d. the rocks' color
9. A .... is a deep valley with high, steep sides.
   a. hill b. mountain c. canyon d. dune
10. .... are lowland areas with gently-sloped sides.
    a. Valleys b. Deltas c. Canyons d. Dunes
11. When a river meets a sea or an ocean, a landform known as a .... is formed.
    a. canyon b. volcano c. mountain d. delta

12 All the following are created by the water of rivers or streams, except ....
b. deltas b. canyons c. valleys d. sand dunes

13 Silt carried by water contains all the following, except ....
a. sand b. clay c. rocks d. glass

14 A sand dune is formed by the .... process, then the .... process.
a. deposition, erosion b. erosion, weathering
c. erosion, deposition d. deposition, weathering

15 Which of the following factors helps in the formation of sand dunes?
a. Water b. Wind c. Light d. Heat

16 When a rock blocks the path of flying sand, a .... may be formed.
a. dune b. river c. canyon d. delta

2 Put (✓) or (✗):

1 Wadi Rum in Jordan is an example of a sand dune. ( )
2 All canyons have the same shape, texture, and color. ( )
3 The sides of the canyon at the beginning of its formation are gently-sloped. ( )
4 Understanding the formation of landforms helps us predict future changes of landforms. ( )
5 It is better to build your house on a hill that is eroding. ( )
6 A river never changes its path, so it's safe to build a house near any river. ( )
7 When a river moves down a steep slope, its speed decreases. ( )
8 Most valleys are formed due to the erosion of many sediments and their transfer far away. ( )
9 The shape of the valley depends on the type of its rocks. ( )
10 A slow-moving river has a lot of energy, so it causes more erosion. ( )
11 A delta is formed when the speed of the river water increases. ( )
12 Silt carried by a river contains large bits of sand and clay. ( )
13 Sand dunes are formed when a rock blocks water-blown sand. ( )
14 Sand dunes are formed by the deposition process only. ( )

15 The formation of sand dunes in the Eastern Desert in Egypt is due to the movement of wind. ( )

16 Dunes are formed at the bottom of seas. ( )

3 Write the scientific term:

1 It's a deep valley that formed due to the weathering and erosion of wind and water. (..........)

2 It's a force that pulls rainwater downhill, forming small streams. (..........)

3 It's the world's largest canyon, located in the USA. (..........)

4 They are often found at the bottom of both canyons and valleys. (..........)

5 It's a sediment carried by a river that contains sand, clay, and rock materials. (..........)

6 It's a fan-shaped land that is formed when a river meets a sea. (..........)

7 It's a process that causes the carving of rocks into different shapes by wind-blown sand. (..........)

4 Complete the following using the words between the brackets:

A (small canyon - impression - V-shaped - water stream - brown and black-colored)

1 When the rain falls on a flat sandy land, it will leave an ....

2 Wadi Nakhr is a .... canyon.

3 Wadi Rum and colored canyon in Sinai are .... canyons.

4 In the beginning of a .... formation, plants and trees grow at the two sides of it due to the effect of the ....

B (less - high - more - gravity - increases - sediments - many layers)

1 Rainwater is pulled downhill, forming a small stream due to ....

2 When the water of a river moves downhill on a steep slope, the water speed ...., which causes .... erosion.

3 A small stream causes .... erosion than a large river.

4 The force of rushing water erodes a lot of .... of a mountain and carries them away.

5 Walls of canyons are very .... and are composed of many ....

C (deposition - canyon - fan - decreases - increases - delta)

1 A .... is formed by the erosion process, while a .... is formed by the deposition process.

2 The Nile River Delta has a .... shape.

3 When the stream water speed ...., it causes .... of sediments.

4 When the force of blowing wind ...., the blown sand is carried for a longer distance.

5 Choose from column (A) what suits it in column (B):

A

Column (A)	Column (B)
1 Wadi Nakhr	a. is a black and brown canyon in Oman.
2 Wadi Rum	b. is a V-shaped canyon in Jordan.
3 Small canyon	c. is a reddish canyon in Thailand.

1 .... 2 .... 3 ....

B

Column (A)	Column (B)
1 Erosion	a. is the fine particles of clay, sand, and rock materials.
2 Deposition	b. occurs when a stream water rushes quickly downhill a mountain.
3 Sand dunes	c. are hills of sand usually seen in groups and they may cover large areas.
4 Silt	d. occurs when a stream water speed slows down at the end of a river.

1 .... 2 .... 3 .... 4 ....



6 Cross out the odd word:

- Mountain - Valley - Gravity - Canyon (..........)

7 Study the following figures, then put (✓) or (✗):

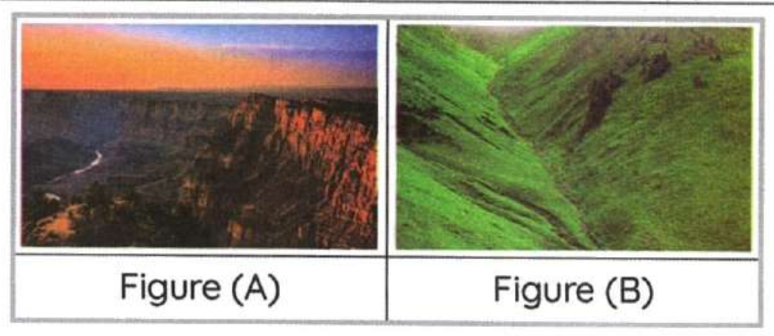
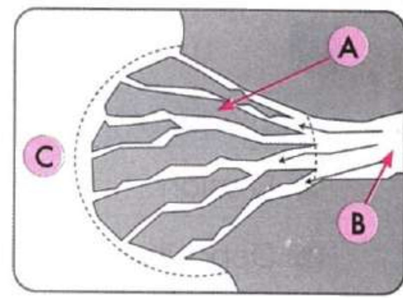


Figure (A)	Figure (B)

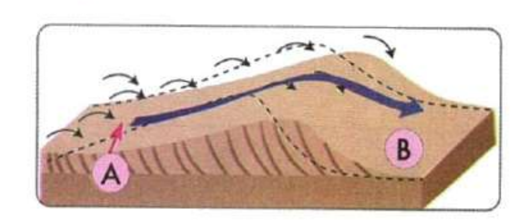
1. The landform in figure (A) has gently-sloped sides. (   )
2. The landform in figure (B) may be surrounded by some plains between mountains. (   )
3. Both landforms are formed due to erosion carried by rivers. (   )
4. The walls of the landform in figure (A) are higher than those in figure (B). (   )

8 Study the following figure, then choose the correct answer:



1. The area (A) would become a .... (delta - canyon) due to the .... (erosion - deposition) process.
2. The .... (area "C" - area "B") could be a sea or a lake.
3. The .... (area "C" - area "B") is a river.

9 Study the following figure, then complete:



1. The erosion of sand occurs in area ....
2. The deposition of wind-blown sand occurs in area ....

10 Give reasons for:

1. It is not safe to build a house close to a river.

....

2. Valleys and canyons are formed in the same way.

....

3. Sand dunes are formed in a desert.

....

11 What happens if?

1. A water stream flows over a flat land?

....

2. A lot of rain falls on a small canyon?

....

3. Small streams of water are joined together? (concerning erosion)

....

4. A river carrying sediments meets a sea?

....

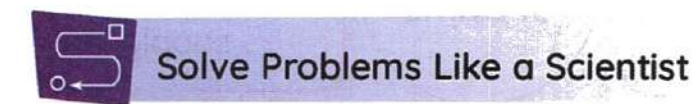
5. Wind-blown sand grains hit a big rock in the desert?

....


PROJECTS

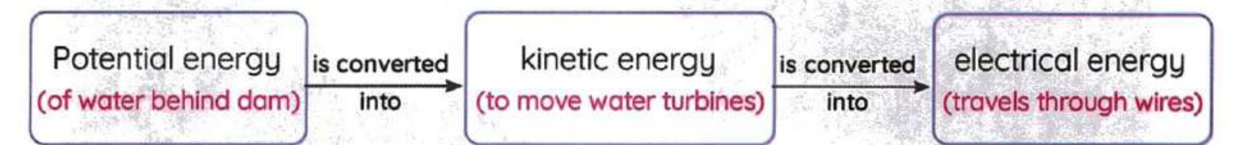


Dam Impacts



- We have learned that humans use the kinetic energy of water to generate **hydroelectricity** by building dams on rivers to control water and increase the energy of water.
- A **dam** is a structure that is built on rivers for conserving water.

Energy Chain of a Dam



Dam

Gravitational potential energy

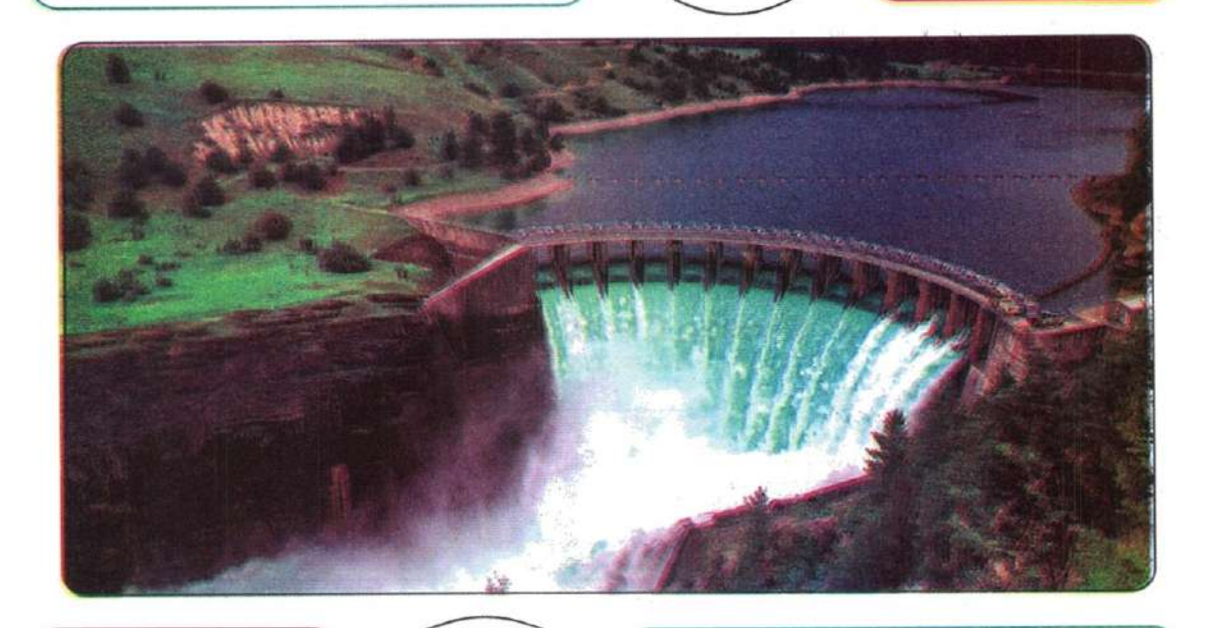
Kinetic energy

Generators

Water turbines

Advantages of Dams

1. They are used to generate hydroelectric energy.
2. They control the flow of water to rotate wind turbines.
3. They provide a steady water supply.



Disadvantages of Dams

1. The cost of construction of dams is high.
2. The change in the path of rivers affects the migration of fish or other natural habitats.
3. There is a risk in the case of earthquakes.

A solution for the problem of building dams

There is a risk in the case of earthquakes.



1. High-standard materials are required to build dams.
2. Regular maintenance of dams is necessary.

Interdisciplinary Project

Sunny Side up

- The project "Sunny Side up" helps you think about the impact of deforestation and how humans can use solar energy as a clean source of energy.

• يساعدك مشروع الجانب المشرق على التفكير فى تأثير إزالة الغابات، وكيف يمكن للإنسان استخدام الطاقة الشمسية كمصدر نظيف للطاقة.

Deforestation

- Cutting down trees to get wood for cooking may lead to **deforestation** that has negative impacts, such as the death of some **animals** or **plants**
- Deforestation can be stopped by using **solar energy** instead of wood from trees as a source of energy for cooking food.
- Some difficulties humans may face when using solar energy including the fact that the materials used to collect solar energy are very expensive.

• قطع الأشجار من أجل الحصول على الوقود الخشبي من أجل الطهي قد يؤدي لإزالة الغابات التي قد يكون لها آثار سلبية مثل موت بعض الحيوانات أو النباتات.

• يمكن وقف إزالة الغابات باستخدام الطاقة الشمسية بدلًا من خشب الأشجار كمصدر للطاقة لطهي الطعام.

• قد يواجه الإنسان بعض الصعوبات عند استخدام الطاقة الشمسية؛ بسبب أن المواد المستخدمة لتجميع الطاقة الشمسية باهظة الثمن.



Solar Cooker

A device that converts solar energy into thermal energy is used in cooking food.

هو جهاز يُحوِّل الطاقة الشمسية إلى طاقة حرارية تُستخدم في طهي الطعام.





Structure:

- It contains **metal plates** placed in a certain way to collect the largest amount of solar energy and focus it in one area.
- It also contains materials that keep the generated thermal energy inside the solar cooker for a period of time enough to cook food inside.

- يحتوي الموقد الشمسي على ألواح معدنية مُوجَّهة بطريقة معينة؛ لتجميع أكبر قدر من الطاقة الشمسية وتركيزها في منطقة واحدة.
- يحتوي أيضًا على مواد تحافظ على الطاقة الحرارية المتولدة داخل الموقد الشمسي لفترة من الوقت تكفي لطهي الطعام بداخله.



Forces That Shape the Earth



Solve Problems Like a Scientist

- In this project, you will use what you know about how the surface of the Earth changes to model how different environmental factors have affected the landscape of Wadi Nakhr over time.
- Wadi Nakhr's landscape has been shaped by the weathering forces of running water, wind, and erosion. You can also find evidence of volcanic activity that occurred millions of years ago.

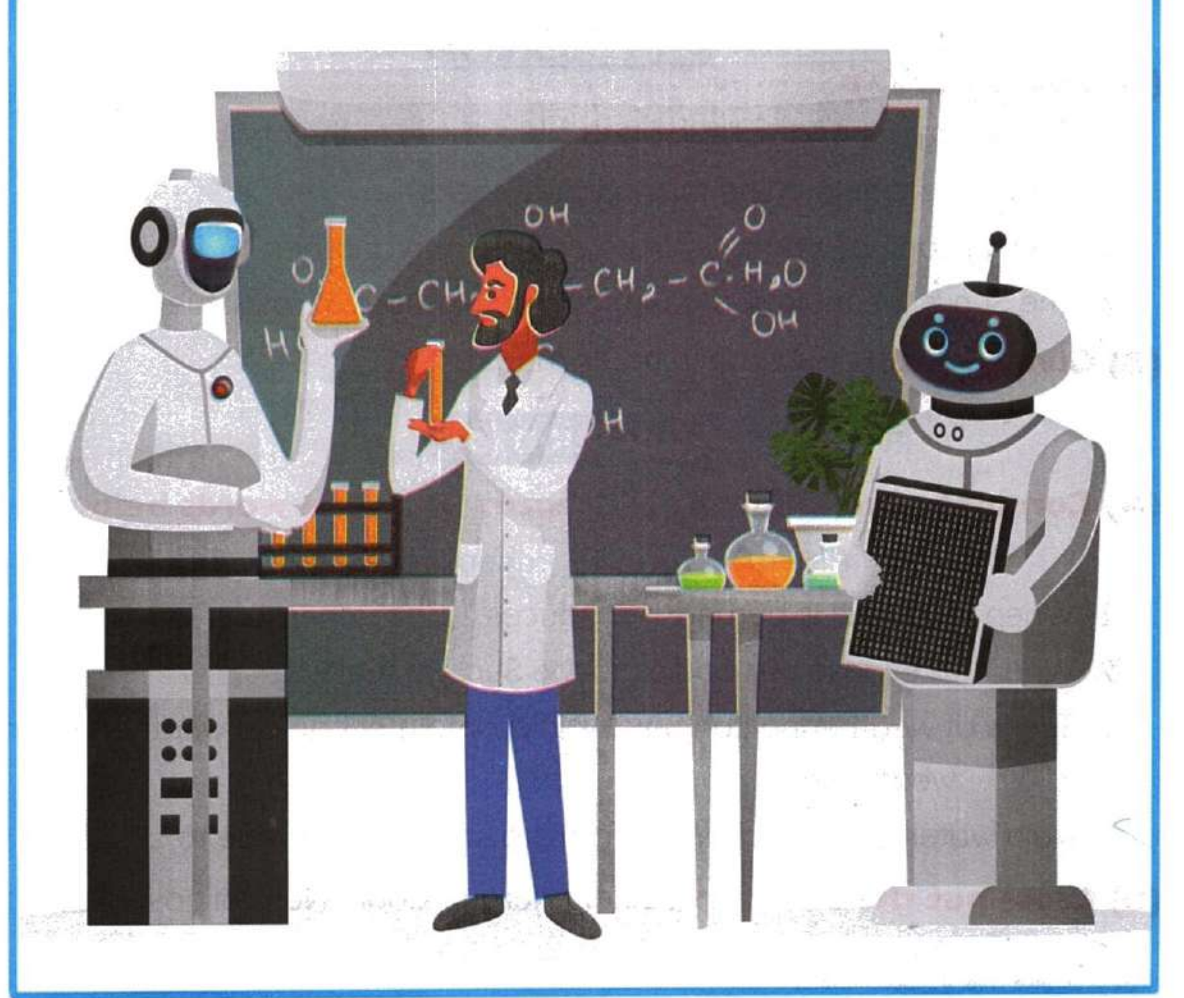
• سنقوم في هذا المشروع بتصميم نموذج يُوضِّح أثر العوامل البيئية على مظاهر السطح في وادي نخر بمرور الزمن.
• لقد تشكّلت مظاهر سطح وادي نخر بفعل التجوية التي سببتها المياه والرياح وعوامل التعرية، وقد تجد أدلة على حدوث نشاط بركاني منذ ملايين السنين.

Look at the images of landforms in Wadi Nakhr.
Then think about how different environmental factors can affect landscapes.
Then predict which factors affected the formation of each landform.

• لاحظ الصور التالية لمظاهر سطح مختلفة فى وادي نخر، فكّر في العوامل البيئية المختلفة التي تؤثر على مظاهر السطح، توقّع العوامل المؤثرة على التضاريس الآتية:

Image	Which factors affected the formation of this landform?	(Reasons) Explain Your Thinking
Large chunks of basalt	• Weathering by the forces of wind and water. • عوامل التجوية التي سببتها الرياح والماء.	• Running water and wind carrying sand carve and break down rocks. • تتسبب المياه الجارية والرياح المحملة بالرمال في نحت وتفتيت الصخور.
Smooth and steep sides		
Deep canyon, layers of rocks		
Folded and rippling mountainsides		

Government Model Exams



1 Cairo Governorate – Exam 1

Question (1)

(A) Choose the correct answer:

1. The forms of fuel present in car fuel stations are ....
   a. gasoline and wood b. natural gas and coal
   c. wood and coal d. natural gas and gasoline
2. Curiosity Rover is designed to explore ....
   a. Earth b. Mars c. the Sun d. the moon
3. Sand is formed by the breaking down of ....
   a. glass b. wood c. rocks d. plastic
4. All the following processes change the Earth's surface, except ....
   a. weathering b. erosion c. digestion d. deposition

(B) What happens to a flat land if a water stream flows over it?

Question (2)

(A) Put (✓) or (✗):

1. Both canyons and valleys often have rivers at their bottom. ( )
2. Plants roots help in the formation of rocks. ( )
3. Energy can't be changed from one form to another. ( )
4. The Sun is the main source of forming biofuel and fossil fuel. ( )

(B) Give a reason for: Iron in rocks may rust.

Question (3)

(A) Complete the following sentences using the words below:

(thermal – gravity – chemical – warm)

1. When fossil fuel is burned, it produces .... energy.
2. When we expose our bodies to the Sun, we feel ....
3. Types of weathering can be classified into mechanical weathering and .... weathering
4. Rain water is pulled downhill forming small stream due to ....

(B) Cross out the odd word: Solar energy - Coal - Natural gas - Gasoline

2 Cairo Governorate – Exam 2

Question (1)

(A) Choose the correct answer:

1. Limestone caves are formed due to the combination of ....
   a. dissolved minerals b. red-colored rusts
   c. living organisms d. acid rains
2. A canyon may take .... of years to be formed.
   a. hundreds b. tens c. millions d. a couple
3. Inside the electric power stations, the heating of .... produces steam.
   a. turbines b. generators c. water d. fuel
4. The energy source in a toy car is the ....
   a. engine b. tires c. battery d. fuel

(B) What happens if: A river carrying sediments meets a sea?

Question (2)

(A) Put (✓) or (✗):

1. Global warming is caused by the increase of the oxygen percentage in the atmosphere. (   )
2. Deposition process never changes the shape of the land. (   )
3. We have to conserve all forms of fuel. (   )
4. Electricity generated by wind turbines is transmitted through the wind. (   )

(B) Give a reason for: Farmers must reduce the usage of pesticides.

Question (3)

(A) Complete the following sentences using the words below:

(natural gas - sand dune - weathering - valley)

1. A .... is formed when blowing-wind sand hits a rock.
2. The .... is the process in which rocks are broken down to form sediments.
3. Some forms of fuel can be used in cooking food, such as wood and ....
4. A .... is a gently-sloped landform found between mountains.

(B) Cross out the odd word:

Solar energy - Wind energy - Natural gas - Water (........)

3 Cairo Governorate - Zeitoun Zone

Question (1)

(A) Choose the correct answer:

1. The main source of most of energy on Earth is the ....
   a. electricity b. Sun c. moon d. wind
2. .... is the process in which sediments are moved to another place on the Earth's surface.
   a. Erosion b. Weathering c. Deposition d. Melting
3. Nonrenewable resources of energy include ....
   a. wood b. gasoline c. grass d. water
4. Which of the following factors helps in the formation of sand dunes?
   a. Water b. Wind c. Light d. Heat

(B) What are the types of weathering?

Question (2)

(A) Put (✓) or (✗):

1. Using fossil fuel protects the environment from pollution. (   )
2. Mechanical weathering causes a change in the structure of the rocks and a new substance is formed. (   )
3. The shape of the valley depends on the types of rocks. (   )
4. The electrical energy that is generated from water is called hydroelectric energy. (   )

(B) What are the factors that cause erosion?

Question (3)

(A) Write the scientific term:

1. It's a deep valley with steep sides. (............)
2. It is formed from the remains of plants and animals buried for long periods of time. (............)
3. Energy can neither be created nor destroyed; it can only be converted from one form to another. (............)
4. They are built on rivers to control the water flow and increase the potential energy of water. (............)

(B) Give an example of: A landform that is formed by deposition process.

4 Cairo Governorate - Al-Azhar Al-Sharif

Question (1)

Choose the correct answer:

1. .... is a renewable resource of energy.
   a. Coal b. Natural gas c. Water d. Fossil fuel
2. The input energy used to control the Mars exploration vehicle is ....
   a. electrical energy b. light energy
   c. kinetic energy d. mechanical energy
3. Which of the following is an evidence of erosion?
   a. Sand dunes formation b. Forming rocks crumbs
   c. Nile River delta formation d. Breaking of a rock

Question (2)

Choose from column (A) what suits it in column (B):

Column (A)	Column (B)
1. The Law of Conservation of Energy:	a. is among nonrenewable energy resources.
2. The Sun	b. Energy isn't destroyed, but it can only be converted from one form to another.
3. Wind turbines	c. convert wind energy into electrical energy.
	d. is the main source of energy on Earth.
	e. Energy is destroyed and cannot be transformed from one form to another.

Question (3)

Put (✓) or (✗):

1. Most valleys are formed due to the erosion of many sediments and their transfer far away. ( )
2. The formation of sand dunes in Eastern Desert in Egypt is due to the movement of the wind. ( )
3. The energy produced from the flowing water of waterfalls and dam turbines is called chemical energy. ( )

Question (4)

Write the scientific term:

1. It's a type of fuel made from living organisms that can be planted.
2. It's the energy produced by the blender that helps it do its job.
3. It's the process in which rocks are broken into smaller particles.

Question (5)

Complete the following sentences using the words below:

(wood - water - electrical - light - coal - natural gas)

1. Ancient people used .... as a fuel before discovering gasoline.
2. .... is a renewable resource of energy.
3. The energy that is produced from solar panels is .... energy.

5 Giza Governorate – Exam 1

Question (1)

(A) Choose the correct answer:

1. In the washing machine, ... energy is converted into kinetic energy.
   a. light   b. thermal   c. electrical   d. potential
2. All the following are forms of fossil fuel, except ....
   a. wind   b. coal   c. natural gas   d. oil
3. Sand is formed due to the breaking down of ....
   a. glass   b. rocks   c. plastic   d. wood
4. The breaking down of large rocks into small particles represents the .... process.
   a. weathering   b. photosynthesis   c. erosion   d. deposition

(B) Give a reason for: The iron in rocks may rust.

Because iron reacts with .... gas.

Question (2)

(A) Put (✓) or (✗):

1. Water causes both mechanical and chemical weathering. (   )
2. A canyon is a type of valleys. (   )
3. Oil and coal are considered nonrenewable energy resources. (   )
4. Dams are built on rivers to control the wind flow. (   )

(B) What happens if:

A river carrying sediments meets the sea?

Question (3)

(A) Complete the following sentences using the words below:

(Sun – water – sound – biofuel)

1. Wind, ... and gravity are natural factors that control the erosion process.
2. Wood and charcoal are examples of ....
3. Most of energy chains start with the ....
4. The output energy of the hand bell is .... energy.

(B) Cross out the odd word:

Plant roots – Wind – Acid rain – Temperature (..................)

6 Giza Governorate – Exam 2

Question (1)

(A) Put (✓) or (✗):

1. Energy cannot be transformed from one form to another. ( )
2. A hand bell converts kinetic energy to sound energy. ( )
3. The Earth's surface changes from time to time. ( )
4. When the iron in rocks rusts, the rocks become stronger. ( )

(B) Give a reason for: Sand dunes are formed.

Sand dunes are formed due to the effect of ....

Question (2)

(A) Choose the correct answer:

1. Both the hair dryer and the electric water kettle produce .... energy.
   a. chemical b. thermal c. light d. potential
2. All the following are renewable energy resources, except ....
   a. natural gas b. water c. the Sun d. wind
3. .... are deep valleys carved by the flowing water.
   a. Mountains b. Hills c. Canyons d. Deltas
4. Moving the sediments from a place to another represents the ...... process.
   a. weathering b. photosynthesis c. erosion d. deposition

(B) Complete: A .... is a triangle-shaped mass of mud and sediments that forms when a river enters a large body of water.

Question (3)

(A) Choose from column (A) what suits it in column (B):

Column (A)	Column (B)
1 Wood	a. is a fossil fuel.
2 Coal	b. is one of the mechanical weathering factors.
3 Acid rain	c. is a biofuel.
4 Temperature	d. is one of the chemical weathering factors.

(B) What happens if: The lichens growing on rocks produce acids?

The rocks will be ....

7 Giza Governorate – Exam 3

Question (1)

Write the scientific term:

1. It's the form of energy that is stored in the battery of a remote control. (..................)
2. It is a phenomenon in which the Earth's temperature increases when carbon dioxide gas increases in the air. (..................)
3. It's energy that is generated from windmills and transmitted through wires to houses and factories. (..................)
4. They're hills of sand in deserts that are formed by erosion and deposition. (..................)
5. They're tiny plant-like organisms that produce acid on rocks, making them break down. (..................)

Question (2)

Put (✓) or (✗):

1. Energy cannot be transformed from one form to another. (   )
2. Most energy chains start with the moon. (   )
3. When pedalling a bike, the chemical energy in your body changes to kinetic energy. (   )
4. There is a stored chemical energy inside the food we eat. (   )
5. Biofuel is a nonrenewable resource of energy. (   )

Question (3)

(A) Choose from column (A) what suits it in column (B):

Column (A)	Column (B)
1 Solar panels	a. are used in cooking food.
2 Curved mirrors	b. were used to grind grains.
3 Windmills	c. are used to generate electricity.

(B) From the opposite figures:

1. What is the name of this device? ....
2. It changes .... energy to .... energy.

8 Qalyubiyya Governorate

Question (1)

(A) Choose the correct answer:

1. .... is the main source of energy on the Earth's surface.
   a. Oil b. Gasoline c. Natural gas d. The Sun
2. In water turbines, the .... energy of the water is changed into electrical energy.
   a. sound b. kinetic c. thermal d. potential
3. .... is a renewable source of energy.
   a. Oil b. Wind c. Coal d. Natural gas
4. .... may cause chemical weathering or mechanical weathering.
   a. Oxygen b. Water c. Rocks d. Lichens

(B) Cross out the odd word:

Weathering – Photosynthesis – Deposition – Erosion (..................)

Question (2)

(A) Put (✓) or (✗):

1. Canyons may take millions of years to be formed. ( )
2. Most of energy chains start with the moon. ( )
3. Charcoal is formed from the decomposition of the remains of ancient plants. ( )
4. Biofuel is a nonrenewable resource of energy. ( )

(B) Write the scientific term:

It's a kind of weathering that changes the structure and color of rocks.

Question (3)

(A) Choose from column (A) what suits it in column (B):

Column (A)	Column (B)
1 A greenhouse	a. are used to generate electricity from solar energy.
2 A valley	b. usually has a triangular shape.
3 A delta	c. has gently-sloped sides.
4 Solar panels	d. helps to grow crops that only grow in warm climates.

(B) Give an example of: A fossil fuel.

9 Alexandria Governorate – Exam 1

Question (1)

(A) Choose the correct answer:

1. Energy isn't destroyed nor created from nothing. This indicates ....
   a. the drawing of energy resources
   b. the conservation and transformation of energy
   c. that the resources of energy are numerous
   d. the destruction of energy resources
2. .... is a resource that we consume at a faster rate than its formation in nature.
   a. Wind b. Water c. Solar energy d. Fossil fuel
3. Dissolving minerals from rocks and recombining them with new substances is an example of ....
   a. mechanical weathering b. weathering by wind
   c. deposition in rivers d. chemical weathering
4. The steep valleys that are formed due to the flowing water erosion are called ....
   a. canyons b. sand dunes c. hills d. delta

(B) Give a reason for:

The roots of trees can be an agent for shaping the Earth's surface.

Question (2)

(A) Complete the following sentences:

1. The output energy of the hair dryer that helps it do its function is .... energy.
2. In large cities, pollution with .... causes irritation in the eyes and lungs.
3. Types of weathering are .... weathering and chemical weathering.
4. After rocks weathering, the process of .... occurs and the sand and soil move to another place.

(B) What happens if:

Oxygen gas reacts with iron rocks forming red-colored rust?

Question (3)

(A) Put (✓) or (✗):

1. Both a canyon and a valley often have rivers or steams that flow through their lowest point. (   )
2. All the changes to Earth's surface take hundreds of years. (   )
3. Wind and solar energy are nonrenewable energy resources. (   )
4. Mars Rover robot uses the same energy used in a remote-controlled toy car. (   )

(B) Write the scientific term: Gasoline - Coal - Natural gas (........)

10 Alexandria Governorate – Exam 2

Question (1)

(A) Complete the following sentences using the words below:

(copper - Sun - electric lamp - charcoal)

1. Wood and .... are examples of biofuel.
2. Most of energy chains start with the ....
3. The device used to convert electrical energy into light energy is the ....
4. Electric wires are made of ....

(B) Put (✓) or (✗): The burning of gasoline produces heat energy. (   )

Question (2)

(A) Choose the correct answer:

1. All the following are processes that can change the Earth's surface, except for ....
   a. digestion b. erosion c. weathering d. deposition
2. .... and .... cause mechanical weathering.
   a. Plant's roots, acid rain b. Lichens, water
   c. Oxygen, water d. Water, plant's roots
3. Oil is a nonrenewable energy resource that is used inside the ....
   a. flashlight b. car engine
   c. electric fan d. washing machine
4. Curiosity Rover is used to explore ....
   a. Earth b. Mars c. the Sun d. the moon

(B) Write the scientific term:

It's the energy produced from playing the guitar. (..................)

Question (3)

(A) Choose from column (A) what suits it in column (B):

Column (A)	Column (B)
1 Water	a. is formed from the remains of dead plants.
2 Wind energy	b. is the main source of energy on Earth.
3 Coal	c. is a liquid renewable resource of energy.
4 The Sun	d. is used to generate electricity through wind turbines.

(B) Give a reason for: The iron in rocks may rust.

11 Alexandria Governorate – Exam 3

Question (1)

(A) Choose the correct answer:

1. When you use the hand bell, ... energy changes into sound energy.
   a. light b. thermal c. kinetic
2. When a rock blocks the path of flying sand, a .... may be formed.
   a. dune b. river c. canyon
3. .... is a renewable resource of energy
   a. Coal b. Natural gas c. Water
4. A canyon may take .... of years to be formed.
   a. tens b. hundreds c. thousands

(B) Give a reason for:

We must turn off the lights that we don't need for a while.

Question (2)

(A) Cross out the odd word:

1. Erosion - Weathering - Digestion - Deposition (..........)
2. Wood - Natural gas - Gasoline - Glass (..........)
3. Acid rain - Wind - Plant root - Temperature (..........)
4. Fossil fuel - Waterfalls - Wind - Sunlight (..........)

(B) What happens if:

The lichens growing on rocks produce acids?

Question (3)

(A) Put (✓) or (✗):

1. Both canyons and valleys often have rivers in their bottom. (   )
2. Solar cells are composed of many solar panels. (   )
3. Mars is located a few meters away from Earth. (   )
4. There is a stored chemical energy inside the food we eat. (   )

(B) Write the scientific term:

It's any substance that produces thermal energy when it is burned. (..........)

12 Dakahlia Governorate

Question (1)

(A) Complete the following sentences:

1. Light energy is converted into .... energy, which is stored in the form of sugar inside the trees.
2. .... is used as a source of thermal energy in homes and cars.
3. .... are deep valleys carved by the flowing water.
4. .... is the process of laying down sediments after their erosion.

(B) What happens if: Acidic rain falls on rocks?

Question (2)

(A) Put (✓) or (✗):

1. Using solar energy is a way to conserve fossil fuel. ( )
2. Water is a nonrenewable resource that is used to generate hydroelectric energy. ( )
3. Acid rain is formed when carbon dioxide dissolves in the water found in the air. ( )
4. Deforestation is caused by the overuse of fossil fuel. ( )

(B) What is the role of wind in mechanical weathering?

Question (3)

(A) I- Write the scientific term:

1. Energy is neither created nor destroyed; it can only be converted from one form to another. (..................)
2. It's a gas in the air that combines with the iron in some rocks and causes its weakness. (..................)

2- Complete the following table:

Device	Input Energy	Output Energy
1 Electric heater	....	....
2 Battery in your toy	....	....

(B) Give a reason for: Dams are built on rivers.

13 Suez Governorate

Question (1)

(A) Choose the correct answer:

1. Curiosity Rover is designed to explore ....
   a. Earth b. Mars c. the Sun d. the moon
2. Which form of energy is not used or produced when you turn on an electric bulb?
   a. Light energy b. Heat energy c. Electrical energy d. Sound energy
3. The formation of canyons takes ....
   a. a few minutes b. a few hours c. a few days d. many years
4. Gentle wind can carry sand grains for .... distances
   a. short b. long c. huge d. large

(B) Give a reason for: Iron in rocks may rust.

Question (2)

(A) Put (✓) or (✗):

1. Wind can be considered one of the factors that cause weathering.( )
2. The Earth's surface never changes. ( )
3. In a modern wind turbine, kinetic energy is converted into chemical energy. ( )
4. The Sun is the main source of energy on Earth. ( )

(B) Cross out the odd word: Gasoline – Charcoal – Coal – Natural gas

Question (3)

(A) Complete the following sentences using the words below:

(gently - renewable - Oil - deposition)

1. The sides of the canyon at the beginning of its formation are .... sloped.
2. .... is a nonrenewable source of energy.
3. Using the .... resources of energy costs more money.
4. The process of laying down sediment after their erosion is called ....

(B) What happens if: A river that carries sediments meets the sea?

14 Port Said Governorate

Question (1)

(A) Choose the correct answer:

1. Fossil fuel needs .... to be formed under the Earth's surface.
   a. five years b. ten years c. hundreds of years d. millions of years
2. Water flows through the turbines in the dams to generate .... energy.
   a. electrical b. potential c. solar d. light
3. When a river meets a sea or an ocean, a landform known as a .... is formed.
   a. canyon b. volcano c. mountain d. delta
4. If the rain falls over a canyon for several times per year, ...
   a. its depth increases b. its depth decreases
   c. it becomes flat d. it won't be affected

(B) Write the scientific term:

It's a process in which rocks are broken down into smaller particles. (............)

Question (2)

(A) Put (✓) or (✗):

1. Most energy chains start with the moon. ( )
2. You need gasoline to move a bicycle. ( )
3. Deposition process never changes the shape of the land. ( )
4. Wind can pick up sand grains and form sand dunes. ( )

(B) Give a reason for: Iron inside rocks may rust.

Question (3)

(A) Correct the underlined word:

1. Curiosity is a robotic vehicle that is designed to explore the surface of the moon.
2. Hydroelectric energy is a nonrenewable energy resource.
3. The origin of sand is the breaking down of some types of glass.
4. When the water of a river travels downhill on a steep slope, its speed decreases.

(B) What happens if:

A river erodes the sediments of a mountain over a long period of time?

15 Behira Governorate

Question (1)

(A) Choose the correct answer:

1. The stored energy inside the battery of a mobile phone is .... energy.
   a. electrical b. light c. chemical
2. Fossil fuel is considered a .... resource of energy.
   a. renewable b. nonrenewable c. permanent
3. .... is the breaking down of rocks into small particles by physical factors.
   a. Mechanical weathering b. Chemical weathering c. Erosion
4. The process in which small particles of sand, soil and rocks are moved from a place to another is ....
   a. weathering b. erosion c. deposition

(B) Write the scientific term:

Energy is neither created nor destroyed. (....................)

Question (2)

(A) Put (✓) or (✗):

1. A spacecraft takes about 6 seconds to go to Mars. (   )
2. Most of the energy we use is produced from the Sun. (   )
3. Some types of plants can be used to make a liquid fuel. (   )
4. The roots of trees can make rocks break down. (   )

(B) What are the effects of the smog from cars on humans' health?

Question (3)

(A) Choose from column (A) what suits it in column (B):

Column (A)	Column (B)
1 Sand dunes	a. are special types of valleys that have steep sides.
2 Canyons	b. are pieces of rock that break down due to weathering and move from their place by the effects of gravity and other factors of transportation.
3 Valleys	c. formed due to windblown- sand.
4 Sediments	d. lowland area between mountains.

(B) Write the scientific term:

It's the device in electric power stations that converts kinetic energy into electrical energy. (....................)

MODEL ANSWERS

Unit 3

Concept 1

Lesson 1

1
1. a 2. b 3. d 4. a
5. b 6. b 7. c 8. c
9. c 10. d 11. c

2
1. ✗ 2. ✓ 3. ✗ 4. ✗
5. ✓ 6. ✗ 7. ✗ 8. ✗

3
1. Curiosity Rover
2. Chemical energy
3. Solar panels
4. Solar energy or light energy

4
1. chemical – electrical
2. replace 3. sensors
4. sound – kinetic

5
(A) 1. c 2. d 3. b
(B) 1. a 2. c 3. b

6
1. (2) 2. (1) 3. 3
4. (2) , (3)

7
1. To be operated and controlled.
2. To be operated so it can move and explore Mars.
3. Because robots on Mars are too far from local stores or sockets (plugs) on Earth to be replaced or recharged.

8
1. The drone cannot be operated.
2. The Mars rover cannot be operated and can't explore Mars.

Lesson 2

1
1. b 2. c 3. d 4. b
5. d 6. b 7. c 8. b
9. d 10. c

2
1. ✗ 2. ✓ 3. ✓ 4. ✗
5. ✓ 6. ✓ 7. ✓ 8. ✗
9. ✓

3
1. The Sun
2. Thermal energy
3. Chemical energy
4. Chemical energy
5. The spring 6. Energy chain

4
1. thermal energy (heat)
2. sound – kinetic 3. Coal
4. chemical - kinetic

5
1. d 2. c 3. a 4. b

6
a. 4 b. 2 c. 1 d. 6
e. 3 f. 5

7
1. Kinetic 2. (1)
3. (1)-(3) 4. (3) 5. (2)

8
1. Light 2. chemical
3. chemical – kinetic

9
1. Because all energy chains start with the Sun.
2. Because some of the energy escapes in other forms that the device doesn't use.
3. Because the chemical energy inside the wood changes into thermal energy.
4. Because the chemical energy inside your body changes into kinetic energy.

Lesson 3

1
1. b 2. b 3. d 4. d
5. b 6. a 7. b 8. a
9. c 10. b 11. b

2
1 ✓ 2 ✓ 3 ✗ 4 ✗
5 ✗ 6 ✓ 7 ✓ 8 ✓
9 ✓ 10 ✗ 11 ✗ 12 ✗
13 ✓ 14 ✓

3
1 Electric lamp
2 Thermal energy
3 Kinetic energy 4 Sound energy
5 Thermal energy
6 Thermal energy
7 Chemical energy
8 Electric energy 9 Light energy
10 The Sun 11 Copper
12 Law of conservation of energy
13 Light energy

4
1 electric
2 electric- output 3 electric
4 sound – kinetic

5
1 light – sound
2 chemical – kinetic
3 input – output

6
1 Lamp 2 Radio
3 Light bulb

7
1 d 2 c 3 a 4 b

8
1 Chemical energy – Light and thermal energies.
2 Kinetic energy – Sound energy
3 Electric energy – Light and thermal energies

9
(A) Chemical – kinetic –thermal
(B) Electric – light – thermal

10
1 Because some of the electric energy changes into thermal energy.
2 Because some of the electric energy is wasted in the form of thermal energy.
3 Because some kinetic energy changes into thermal energy due to friction.

11
1 The kinetic energy changes into thermal energy.
2 The electric energy changes into light and thermal energies.
3 The electric energy changes into kinetic energy.
4 The potential energy changes into kinetic energy.
5 They will get warm (as their temperature increases).
6 You will feel warm.
7 The chemical energy changes into kinetic energy.
8 The electric energy changes into light and sound energies.

Lesson 4

1
1 b 2 c 3 d 4 b
5 d 6 a

2
1 ✗ 2 ✓ 3 ✗ 4 ✓
5 ✓ 6 ✗

3
1 Sound energy
2 Thermal energy

4
1 c 2 d 3 b 4 a

5
1 Because it doesn't help the blender do its function.
2 Because it helps the electric heater do its function.

6 It will produce thermal energy.

Model Exam 1

Question 1

(A) 1 a 2 c 3 d 4 b

(B) Thermal energy

Question 2

(A) 1 ✓ 2 ✗ 3 ✓ 4 ✓

(B) Lamp

Question 3

(A) 1 c 2 d 3 b 4 a

(B) Because it doesn't help the device do its function.

Model Exam 2

Question 1

(A) 1 a 2 c 3 d 4 b

(B) Thermal energy

Question 2

(A) 1 ✗ 2 ✓ 3 ✗ 4 ✗

(B) Light bulb

Question 3

(A)

Device	Input Energy	Output Energy
Blender	Electric energy	Kinetic and sound energies
Kettle	Electric energy	Thermal energy
Hand bell	Kinetic energy	Sound energy

(B) The electric energy will be converted into kinetic energy.

Concept 2

Lesson 1

1
1 d 2 b 3 d 4 c
5 c 6 d 7 b 8 d
9 a 10 d

2
1 ✓ 2 ✗ 3 ✗ 4 ✓
5 ✗ 6 ✗ 7 ✓ 8 ✗
9 ✗

3
1 The Sun
2 Gasoline pointer
3 Gasoline
4 Chemical energy
5 Thermal energy

4
1 Fossil fuel – underground
2 gasoline pointer
3 coal – wood 4 Oil

5
(A) 1 c 2 a 3 b
(B) 1 b 2 c 3 d 4 a
(C) 1 b 2 d 3 c 4 a

6
1 gasoline pointer – fuel
2 (1) 3 (3) 4 (2)

7
1 Because gasoline burns inside the car's engine, the engine then rotates the wheels of the car.
2 Because it helps the driver check the fuel in the car's fuel tank.

8
1 The chemical energy changes into thermal energy.
2 The car will stop.
3 The chemical energy stored in the gasoline is converted into thermal energy.

Lesson 2

1
1 c 2 b 3 b 4 d
5 b 6 a 7 b 8 c
9 d 10 b 11 a 12 c
13 d

2
1 ✓ 2 ✗ 3 ✗ 4 ✗
5 ✗ 6 ✗ 7 ✗ 8 ✗
9 ✓ 10 ✓ 11 ✗ 12 ✓

3
1 The Sun
2 Fuel 3 Nonrenewable resource
4 Renewable resource
5 Biofuel. 6 Fossil fuel
7 Oil 8 Coal 9 Charcoal
10 Liquid fuel 11 Deforestation

4
(A) 1 wood
2 oil-underground
3 deforestation
(B) 1 heat – pressure
2 Oil – coal
3 renewable – nonrenewable
4 decreased

5
(A) 1 c 2 a 3 b
(B) 1 b 2 c 3 d 4 a

6

Renewable Resource of Energy	Nonrenewable Resource of Energy
Charcoal	Oil
Corn	Gasoline
Grass	Natural gas
Wood	Coal
Water	
Wind	

7
a (4) b (2) c (3) d (1)

8
a (2) b (4) c (3) d (1)
e (5)

9
1 Oil 2 Coal
3 Charcoal 4 Coal

10
(A)

P.O.C	Fossil Fuel	Biofuel
Renewable or Nonrenewable	Nonrenewable	Renewable
Examples	Oil – Coal – Natural gas	Wood – Grass – Charcoal

(B)

P.O.C	Coal	Charcoal
Type of Fuel	Fossil fuel	Biofuel
Primary Source	Sun	Sun
Renewable or Nonrenewable	Nonrenewable	Renewable

11
1 Because they cannot be easily renewed.
2 Because it is renewed by the continuous growth of plants.
3 Because it will cause deforestation.
4 Because it is extracted from deep ground under the Earth's surface and can't be renewed easily.

12
1 They will be decomposed and turned into oil or natural gas.
2 It will cause deforestation.
3 They will be decomposed and turned into coal.

Lesson 3

1
1. c 2. a 3. d 4. c
5. a 6. b 7. a 8. c
9. c 10. b

2
1. ✗ 2. ✗ 3. ✓ 4. ✓
5. ✗ 6. ✓ 7. ✓ 8. ✓
9. ✗

3
1. Renewable resources
2. Thermal energy
3. Electrical energy
4. Steam 5. Turbine
6. Generator

4
1. steam - generators
2. Kinetic - electric
3. coal - natural gas

5
1. b 2. d 3. a 4. c

6
1. Moonlight 2. Water

7
1. (3) 2. (1) 3. (5) 4. (4)
5. (2)

8
1. To reduce the burning of fossil fuel and air pollution.
2. Because it converts the kinetic energy into electrical energy.

9
1. It will produce thermal energy that heats water to turn it into steam.
2. It operates turbines to produce kinetic energy.
3. It turns into steam.
4. It will generate electricity.

Lessons 4 & 5

1
1. d 2. c 3. c 4. b
5. d 6. b 7. d 8. d
9. d 10. b 11. d 12. c
13. d 14. a 15. d 16. d

2
1. ✓ 2. ✗ 3. ✗ 4. ✓
5. ✓ 6. ✗ 7. ✗ 8. ✗
9. ✓ 10. ✓ 11. ✓ 12. ✗

3
1. Global warming 2. Acid rain
3. Carbon dioxide
4. Renewable resources
5. Nonrenewable resources
6. Smog

4
1. renewable
2. temperature - climate
3. air 4. water- soil

5
1. b 2. d 3. a 4. c

6
a. (2) b. (4) c. (3) d. (5)
e. (1)

7

P.O.V	Acid Rain	Global Warming
Reason of Formation	Carbon dioxide is produced from burning fossil fuel.	Carbon dioxide is produced from burning fossil fuel.
Disadvantages	1. Death of trees 2. Erosion of buildings	Increase the Earth's temperature and change the climate

8
1. To reduce the burning of fossil fuel and pollution.
2. Because fossil fuel can't be renewed easily.

3 Because solar energy doesn't pollute the environment.
4 Because they cause water and soil pollution.

9 1 It will cause global warming
2 Fossil fuel will run out.
3 It will dissolve the buildings' rocks.
4 It will cause air, water, and soil pollution.

Model Exam 1

Question 1

(A) 1 d 2 a 3 d 4 a
(B) Generator

Question 2

(A) 1 ✗ 2 ✗ 3 ✗ 4 ✓
(B) Charcoal

Question 3

(A) 1 b 2 c 3 d 4 a
(B) Because it takes millions of years to be formed and can't be renewed easily.

Model Exam 2

Question 1

(A) 1 d 2 c 3 c 4 a
(B) Nonrenewable energy resources

Question 2

(A) 1 ✗ 2 ✗ 3 ✓. 4 ✓
(B) Coal

Question 3

(A) a 2 b 4 c 3 d 1
e 5
(B) These remains will be transformed into coal.

Concept 3
Lesson 1

1 1 b 2 c 3 d 4 b
5 b 6 a 7 a 8 c
9 c 10 d 11 b 12 c
13 a

2 1 ✗ 2 ✓ 3 ✗ 4 ✗
5 ✗ 6 ✓ 7 ✗ 8 ✗
9 ✗ 10 ✗

3 1 Renewable energy resources
2 Sun 3 Concave mirrors
4 Wind turbines
5 Solar water heater

4 1 kinetic - electric
2 kinetic - electric
3 water- wind 4 Coal - oil
5 shorter 6 less
7 mirrors- sunrays
8 Greenhouses

5 1 Wind, water 2 Oil, coal

6

P.O.C	Old Windmills	Wind Turbines
Function	Grinding grain	Generating electricity
Number of Blades	More blades	Fewer blades
Height	Shorter	Taller

7 (A) 1 b 2 c 3 a
(B) 1 b 2 c 3 a

8 1 (1) 2 (1) - (2)
3 way of working
4 kinetic energy of wind

9
1. a. A concave mirror
   b. It collects and focuses sunrays on metallic pots to cook food.
2. a. solar energy
   b. thermal energy
   c. the roof of houses

10
1. It will produce kinetic energy to grind grain and make flour.
2. It will not generate electricity.

11
1. Because it is natural resource that never runs out.
2. To grind grains to make flour.
3. To generate electricity.
4. To make their lives easier.
5. Because atmosphere, water, and the Earth's surface absorb the radiant energy of the Sun causing a rise in the Earth's temperature.
6. Because they help farmers plant the crops that only grow in a warm climate.

Lesson 2

1
1. b 2. b 3. c 4. c
5. b 6. c 7. d

2
1. ✗ 2. ✗ 3. ✓ 4. ✗
5. ✓ 6. ✗ 7. ✓ 8. ✓

3
1. Wind turbine 2. The Sun
3. Generator

4
1. warms 2. move - blow
3. kinetic - electric 4. wires
5. electric - irrigation equipment

5
a. 4 b. 2 c. 5 d. 3
e. 1

6
1. It changes kinetic energy into electric energy.
2. It generates more electricity, as its efficiency increases.

7
1. Due to the difference in temperature between cold and hot air.
2. Because it converts the kinetic energy into electric energy.

Lessons 3 & 4

1
1. c 2. b 3. b 4. a
5. d 6. b

2
1. ✓ 2. ✓ 3. ✓ 4. ✗
5. ✗ 6. ✗

3
1. Generator 2. Dam
3. Hydroelectric energy

4
1. kinetic
2. Wind turbines – water turbines
3. wires
4. evaporates – condenses

5

P.O.C	Wind Turbines	Water Turbines
Location	Windy areas	On rivers and waterfalls
Similarities	• Both use renewable energy resources. • Both change the kinetic energy into electric energy.	

6
1. a. A b. potential – kinetic
2. a. a dam b. potential
   c. generator – hydroelectricity

7
1. The potential energy of the water will increase.
2. Its potential energy will change into kinetic energy.

8 To control the flow of water and increase its potential energy.

Model Exam 1

Question 1

(A) 1 b 2 a 3 d 4 b

(B) Dam

Question 2

(A) 1 ✗ 2 ✗ 3 ✓ 4 ✗

(B) Because atmosphere, water, and the Earth's surface absorb the radiant energy of the Sun causing a rise in the Earth's temperature.

Question 3

1 solar water energy
2 thermal energy
3 the roof of houses

Model Exam 2

Question 1

(A) 1 c 2 d 3 c 4 a

(B) Solar heater

Question 2

(A) 1 ✗ 2 ✓ 3 ✓ 4 ✗

(B) Electricity won't be generated.

Question 3

1 b 2 c 3 a

School Book
Assess Your Learning on Unit 3

1. 1 b 2 b 3 c 4 b 5 c 6 a 7 c 8 c 9 c

2. a (2) b (4) c (1) d (3) e (5)

3. Electric energy - light energy - thermal energy

4. Turbines - Generator
Inputs: Kinetic Outputs: Electrical

Unit 4

Concept 1
Lesson 1

1. 1 d 2 b 3 b 4 d 5 c 6 c 7 d

2. 1 ✗ 2 ✗ 3 ✓ 4 ✗ 5 ✓ 6 ✓ 7 ✗ 8 ✓ 9 ✗ 10 ✓

3. 1 Water 2 Canyons

4. 1 changing 2 Water 3 weaker 4 very long

5. 1 steep
2 quickly - very slowly
3 Wind - water
4 Coastal rocks- sandcastle

6. 1 b 2 a

7. 1 (1) 2 (1), (3) - (2) 3 (2)

8. 1 Due to the effects of wind, water, and weather conditions.
2 Because some changes are fast and some are very slow.
3 Because it is washed away by sea waves.
4 Because water and wind may break off some parts of its rocks.

9. 1 The sandcastle will disappear after a while.
2 The sandcastle will be disappeared and the coastal rocks will be the same.

Lesson 2

1
1 b 2 b 3 c 4 c
5 c 6 b 7 c 8 d
9 c 10 b 11 d 12 a
13 b 14 c 15 b 16 d
17 c

2
1 ✗ 2 ✓ 3 ✗ 4 ✓
5 ✗ 6 ✓ 7 ✗ 8 ✗
9 ✗ 10 ✓ 11 ✓

3
1 weathering 2 red
3 Roots 4 Oxygen
5 chemical weathering
6 wider 7 rocks

4
1 plants roots 2 Acids
3 Acid rain
4 Mechanical – chemical
5 oxygen – iron

5
1 Erosion 2 Weathering
3 Deposition
4 Mechanical weathering
5 Chemical weathering
6 Lichens 7 Oxygen
8 Root
9 Limestone cave
10 Iron

6
1 c 2 d 3 b 4 a

7
a (3) b (2) c (4) d (1)

8
1 (M) 2 (C) 3 (M) 4 (C)
5 (C) 6 (C) 7 (M) 8 (C)

9
1 (4) 2 (1) 3 (3)

10
1 Because it helps you decide what to wear when you go outside.
2 Because it may cause the breaking down of statues and the peeling of buildings' paint.
3 Due to the weathering process.
4 Because the oxygen reacts with iron in a toy car, forming rust.
5 Because the oxygen reacts with iron in rocks, forming rust and breaking off rocks.
6 Because they produce acids that dissolve minerals found in rocks.
7 Because it causes the smoothing of rocks and breaks them down.
8 Because it breaks down the rocks without changing their structure.

11
1 It will rust.
2 It will smooth the rocks and break them.
3 The rocks will be weak and easy to break.
4 It will dissolve minerals in rocks, causing them to break off.
5 It will cause chemical weathering by dissolving minerals that recombine, forming new substances.
6 Acid will eat away rocks so they become weaker and break down easily.
7 The cracks become wider, so the rock breaks down.

Lesson 3

1
1 c 2 b 3 b 4 b
5 b 6 d 7 c

2
1 ✓ 2 ✗ 3 ✓ 4 ✓
5 ✗ 6 ✓

3
1 chemical 2 long
3 mechanical 4 mechanical

4
1. Chemical – mechanical
2. matter
3. breaks down
4. long

5
1. Chemical weathering
2. Mechanical weathering

6
1. Because the biscuit is broken into small pieces, but it is still same material.
2. Because it produces a completely different new substance "dough".
3. Because chemical weathering causes a completely new different matter.

7
1. The material will not change and mechanical weathering occurs.
2. The materials will change and chemical weathering will happen.

Lessons 4 & 5

1
1. b 2. d 3. a 4. c
5. c 6. c 7. b 8. a
9. d 10. a

2
1. ✓ 2. ✓ 3. ✗ 4. ✗
5. ✗ 6. ✗ 7. ✗ 8. ✓
9. ✗ 10. ✓ 11. ✓ 12. ✗

3
1. Erosion
2. Gravity
3. River
4. Deposition
5. Delta

4
1. gentle wind – hurricane – Egyptian Western Desert
2. Nile delta
3. water
4. deposition

5
1. c 2. b 3. a

6
1. Weathering
2. Deposition
3. Deposition
4. Erosion
5. Deposition
6. Erosion

7
1. Because it pulls broken rocks down mountainsides.
2. Due to the deposition of sand carried by the wind.
3. Because deposition occurs when eroded sediment stop moving.

8
1. Rain washes the soil, causing erosion.
2. Sand will be deposited, forming sand dunes.
3. It will form a delta.

Model Exam 1

Question 1

(A) 1. c 2. b 3. d 4. c

(B) It will form a red -rust layer on rocks.

Question 2

(A) 1. ✓ 2. ✗ 3. ✓ 4. ✓

(B) Because oxygen gas reacts with iron found in rocks.

Question 3

(A)
1. rocks
2. Limestone caves
3. weathering
4. expands

(B) Lichens

Model Exam 2

Question 1

(A) 1. b 2. d 3. a 4. c

(B) Erosion

Question 2

(A) 1. ✗ 2. ✗ 3. ✗ 4. ✓

(B) Digestion

Question 3

(A) 1. d 2. a 3. b 4. c

(B) It will dissolve minerals of the rocks so the rocks become weaker and break down easily.

Concept 2

Lesson 1

1. 1 c 2 c 3 c 4 a 5 b 6 d
2. 1 ✓ 2 ✗ 3 ✗ 4 ✗ 5 ✓
3. 1 Canyon
   2 Wadi Nakhr canyon
   3 Colored Canyon
4. 1 impression
   2 brown and black colored
   3 V-shaped
   4 small canyon – water stream
5. 1 c 2 b 3 a
6. 1 Gravity
7. 1 canyon – million
   2 Weathering – erosion
8. 1 Because a stream of water may have formed it.
   2 Because they have different rocks, texture, and color.
9. 1 It will leave impression and may form a small canyon.
   2 The small canyon will get deeper.

Lesson 2

1. 1 a 2 b 3 b 4 c
2. 1 ✗ 2 ✓ 3 ✗ 4 ✓ 5 ✓ 6 ✗
3. 1 Weathering 2 erosion
   3 deposition 4 many years
4. 1 c 2 b 3 a
5. 1 Because it helps us predict the future changes of landforms.
   2 Because the river path may change and cause erosion and deposition of the house.
6. 1 The house may get eroded.

Lesson 3

1. 1 b 2 c 3 a 4 b 5 d 6 b 7 c 8 a 9 d
2. 1 ✗ 2 ✓ 3 ✗ 4 ✓ 5 ✓ 6 ✗ 7 ✗ 8 ✓ 9 ✓ 10 ✓ 11 ✗
3. 1 Gravity 2 Canyon
   3 The Grand Canyon
   4 Rivers
4. 1 gravity
   2 increases – more
   3 less 4 sediments
   5 high – many layers
5. 1 ✗ 2 ✓ 3 ✓ 4 ✓
6. 1 Because they are formed due to the erosion by rivers or streams.
   2 Due to the gravity.
7. 1 A canyon may be formed.
   2 The water speed increases causing more erosion.
   3 The water of the river will cause more erosion.

Lessons 4 & 5

1
1 d 2 d 3 d 4 a
5 b 6 d 7 c 8 b
9 b 10 a

2
1 ✓ 2 ✗ 3 ✗ 4 ✗
5 ✗ 6 ✓ 7 ✗ 8 ✗
9 ✗ 10 ✗ 11 ✓ 12 ✗

3
1 Silts 2 Delta
3 Mediterranean Sea
4 Wind erosion 5 Sand dune

4
1 canyon - delta 2 fan
3 decreases - deposition
4 increases

5
1 b 2 d 3 c 4 a

6
1 delta - deposition
2 area "C" 3 area "B"

7
1 A 2 B

8
1 Because wetland plants slow down water and increase deposition rates.
2 Because river water speed decreases.
3 Because wetland plants are responsible for slowing down the water.
4 Because sand dunes are formed when a barrier like a rock blocks the wind.

9
1 A delta is formed.
2 Sand grains will be deposited forming sand dunes.
3 Sand grains are blown from South to North direction.

Model Exam 1

Question 1
(A) 1 c 2 a 3 a 4 d
(B) The canyon will get deeper and becomes a bigger canyon.

Question 2
(A) 1 ✓ 2 ✓ 3 ✗ 4 ✗
(B) Because the river may change its path and erode the house.

Question 3
(A) 1 sand dune
2 delta - sediments
3 less
(B) Canyon

Model Exam 2

Question 1
(A) 1 b 2 c 3 d 4 a
(B) Weathering and erosion

Question 2
(A) 1 ✗ 2 ✗ 3 ✓ 4 ✗
(B) Gravity

Question 3
(A) 1 b 2 a 3 d 4 c
(B) The sediments will be deposited and form a delta.

School Book
Assess Your Learning on Unit 4

1
1 d 2 d 3 b 4 b
5 a 6 b 7 c 8 a
9 b 10 a 11 c

2
1 Erosion of water (Valley)
2 Deposits of water (Delta)
3 Erosion and deposition due to wind (Sand dune)

Final Revision Model Answers

Unit 3

Concept 1

1
1. b 2. a 3. c 4. c
5. b 6. d 7. b 8. c
9. b 10. d 11. a 12. a
13. c 14. b 15. d

2
1. ✓ 2. ✗ 3. ✗ 4. ✗
5. ✓ 6. ✗ 7. ✓ 8. ✓
9. ✗ 10. ✓ 11. ✓ 12. ✗
13. ✓ 14. ✓

3
1. Mars Curiosity Rover
2. Chemical energy
3. The Sun
4. Thermal energy
5. Chemical energy
6. Energy chain
7. Electric lamp
8. Thermal energy
9. Kinetic energy
10. Sound energy
11. Thermal energy
12. Thermal energy
13. Copper
14. Thermal energy

4
1. heat
2. sound – kinetic
3. Coal
4. electrical – output
5. electrical

5
1. Lamp
2. Light bulb

6
(A) 1. a 2. c 3. b
(B) 1. d 2. c 3. a 4. b
(C) 1. d 2. c 3. a 4. b
(D) 1. c 2. d 3. b 4. a

7
1. Kinetic 2. (1)
3. (1) – (3) 4. (3) 5. (2)

8
(A) Chemical – kinetic – thermal
(B) Electrical – light – thermal

9
1. Because the robot is very far from any store or any plug.
2. Because when the wood of the trees is burned, chemical energy stored in wood is changed into thermal energy.
3. Because the chemical energy stored in the food is converted into kinetic energy that helps your body move.
4. Because electrical energy changes into light and heat energies.
5. Because sound energy doesn't help the blender do its main function.
6. Because thermal energy helps the electric heater do its main function.

10

1. Kinetic energy changes to thermal energy.
2. Electrical energy changes into light and thermal energies.
3. Electrical energy changes into kinetic energy.
4. Some of the produced energy is lost in the form of heat.

Concept 2

1

1 d	2 c	3 d	4 a
5 b	6 d	7 a	8 a
9 c	10 d	11 a	12 a
13 c	14 c	15 c	16 d
17 b	18 a	19 d	

2

1 ✗	2 ✓	3 ✓	4 ✗
5 ✗	6 ✗	7 ✗	8 ✓
9 ✓	10 ✗	11 ✓	12 ✓
13 ✗	14 ✓	15 ✗	16 ✗
17 ✗			

3

1. Gasoline pointer
2. Gasoline
3. Chemical energy
4. Thermal energy
5. Fuel
6. Nonrenewable resource
7. Renewable resource
8. Biofuel 9. Fossil fuel
10. Oil (Natural gas)
11. Coal 12. Charcoal
13. Liquid fuel
14. Electrical energy 15. Turbine
16. Generator
17. Global warming 18. Acid rain
19. Carbon dioxide

4

1. wood - coal
2. temperature - pressure
3. renewable - nonrenewable
4. steam - generators
5. kinetic - electrical
6. renewable 7. air
8. water - soil

5

1. wood
2. oil - underground
3. deforestation

6

(A)	1 b	2 c	3 d	4 a
(B)	1 c	2 a	3 b	
(C)	1 b	2 c	3 d	4 a
(D)	1 b	2 d	3 a	4 c

7

1. Oil 2. Coal
3. Charcoal

8

1. To help the driver check the amount of gasoline (fuel) left in the car's fuel tank.
2. Because it starts to run out as we use it and can't be renewed easily.
3. Because it is renewed with the continuous growth of plants.
4. Because generators convert kinetic energy into electrical energy.

5 Because it takes millions of years to be formed and starts to run out as we use it and can't be renewed easily.

6 To reduce the burning of fossil fuels in normal vehicles and reduce air pollution.

9
1 Chemical energy changes into thermal energy.
2 It leads to deforestation.
3 It produces thermal energy that changes the water into steam.
4 It turns into steam.
5 It may cause the decomposition of some rocks, including bricks of buildings.

Concept 3

1
1 b   2 d   3 b   4 a
5 c   6 a   7 b   8 b
9 d   10 b   11 b   12 d

2
1 ✗   2 ✓   3 ✗   4 ✗
5 ✗   6 ✓   7 ✗   8 ✗
9 ✗   10 ✗   11 ✗   12 ✓
13 ✓   14 ✗   15 ✗

3
1 Renewable energy resources
2 Concave mirrors
3 Wind turbine
4 Solar heater
5 Generator
6 Dam
7 Hydroelectric energy

4
1 kinetic – electrical
2 kinetic – electrical
3 less
4 mirrors – sunrays
5 Greenhouses
6 move – blow
7 wires

5
1 b   2 c   3 a

6
1 (1)
2 (1) – (2)
3 their ways of working
4 the kinetic energy of the wind to be operated.

7
a 4   b 2   c 5   d 3
e 1

8
1 To grind grains to make flour.
2 To generate the electricity needed to light houses and operate different devices.
3 Because the atmosphere, water and soil absorb heat energy from the Sun.
4 Because they help farmers in planting crops that need warm weather.
5 Because it changes the kinetic energy to electrical energy.
6 To control the flow of water and increase the gravitational potential energy of water to generate electricity.

9
1. The wind turbines will not move, so they can't generate electricity.
2. They will rotate faster and produce more electrical energy.
3. The gravitational energy of water changes into kinetic energy to rotate the water turbines and generate electricity.

Unit 4

Concept 1

1

1 c	2 d	3 b	4 c
5 c	6 d	7 a	8 b
9 c	10 b	11 d	12 b
13 d	14 a	15 c	16 a

2

1 ✓	2 ✗	3 ✓	4 ✗
5 ✗	6 ✗	7 ✗	8 ✗
9 ✓	10 ✓	11 ✓	12 ✗
13 ✓	14 ✓	15 ✗	

3
1. Canyons
2. Erosion process
3. Deposition process
4. Chemical weathering
5. Lichens
6. Oxygen gas
7. Chemical weathering
8. Mechanical weathering
9. Gravity
10. River's water
11. Deposition process
12. Delta

4 (A)
1. plant roots
2. Acids
3. Acid rain
4. Mechanical – chemical
5. oxygen – iron

(B)
1. gentle wind – hurricane – Egyptian Western Desert
2. Nile Delta
3. water
4. deposition

5 1 c 2 d 3 b 4 a

6 1 (4) 2 (1) 3 (3)

7
1. Because of many factors, such as wind, water and weather.
2. Because oxygen gas can react with the iron in the rocks forming red-colored rust, which makes the rock weaker and break down easily.
3. Because they produce acids on rocks that makes the rock weaker and breaks down easily.
4. Because chemical weathering changes the rocks structure and forms a new matter, while mechanical weathering doesn't change the rocks structure.
5. Because eroded rocks must be deposited after some time.

8
1. The rocks become weaker and break down easily.
2. Acid rain will dissolve the minerals in rocks, so they become weaker and can be broken off more easily.

3 The acids cause the breaking down of rocks.

4 The cracks become wider, so the rocks break down easily.

Concept 2

1

1 c	2 c	3 a	4 a
5 b	6 c	7 b	8 d
9 c	10 a	11 d	12 d
13 d	14 c	15 b	16 a

2

1 ✗	2 ✗	3 ✓	4 ✓
5 ✗	6 ✗	7 ✗	8 ✓
9 ✓	10 ✗	11 ✗	12 ✗
13 ✗	14 ✗	15 ✓	16 ✗

3
1 Canyon
2 Gravity
3 The Grand Canyon
4 Rivers (Streams)
5 Silt
6 Delta
7 Erosion

4 (A)
1 impression
2 brown and black-colored
3 V-shaped
4 small canyon – water stream

(B)
1 gravity
2 increases – more
3 less
4 sediments
5 high – layers

(C)
1 canyon – delta
2 fan
3 decreases – deposition
4 increases

5 (A) 1 a 2 b 3 c

(B) 1 b 2 d 3 c 4 a

6 Gravity

7 1 ✗ 2 ✓ 3 ✓ 4 ✓

8
1 delta – deposition
2 area "C" 3 area "B"

9 1 A 2 B

10
1 Because the river may change its path and cause erosion and deposition of the house.
2 Because they are formed due to erosion by rivers or streams.
3 Due to the erosion and deposition of the wind-blown sand.

11
1 It may form a small canyon.
2 This small canyon becomes deeper.
3 They will form a river causing more erosion.
4 Sediments will be deposited forming a delta.
5 Sand is deposited forming a sand dune.

Government Model Exams Answers

1 Cairo Governorate – Exam 1

Question 1

(A) 1 d 2 b 3 c 4 c

(B) A small canyon may be formed.

Question 2

(A) 1 ✓ 2 ✗ 3 ✗ 4 ✓

(B) Due to the reaction with oxygen causing chemical weathering.

Question 3

(A) 1 thermal 2 warm 3 chemical 4 gravity

(B) Solar energy

2 Cairo Governorate – Exam 2

Question 1

(A) 1 a 2 c 3 c 4 c

(B) The sediments will be deposited forming a delta.

Question 2

(A) 1 ✗ 2 ✗ 3 ✓ 4 ✗

(B) Because they mix with the water in the canals causing water and soil pollution.

Question 3

(A) 1 sand dune 2 weathering 3 natural gas 4 valley

(B) Natural gas

3 Cairo Governorate - Zeitoun Zone

Question 1

(A) 1 b 2 a 3 b 4 b

(B) Chemical weathering - Mechanical weathering

Question 2

(A) 1 ✗ 2 ✗ 3 ✓ 4 ✓

(B) Wind, water, and the gravity

Question 3

(A) 1 Canyon 2 Fossil fuel 3 Law of Conservation of Energy 4 Dams

(B) Delta

4 Cairo Governorate - Al-Azhar Al-Sharif

Question 1

1 c 2 b 3 b

Question 2

1 b 2 d 3 c

Question 3

1 ✓ 2 ✓ 3 ✗

Question 4

1 Biofuel 2 Kinetic energy 3 Weathering

Question 5

1 wood 2 Water 3 electrical

11 Alexandria Governorate – Exam 3

Question 1

(A) 1 c 2 a 3 c 4 b

(B) To conserve electricity.

Question 2

(A) 1 Digestion 2 Glass
3 Acid rain 4 Fossil fuel

(B) Acids will eat away rocks so they become weaker and are broken down easily.

Question 3

(A) 1 ✓ 2 ✗ 3 ✗ 4 ✓

(B) Fuel

12 Dakahlia Governorate

Question 1

(A) 1 chemical 2 Natural gas
3 Canyons 4 Deposition

(B) It will dissolve the minerals in the rocks, so the rocks become weaker and break down easily.

Question 2

(A) 1 ✓ 2 ✗ 3 ✓ 4 ✗

(B) Friction occurs between sand grains carried by wind and rock.This causes smoothing of rocks and breaking them down.

Question 3

(A) 1- 1 Law of Conservation of Energy
2 Oxygen gas

2- 1 Electrical energy – Thermal energy
2 Chemical energy – Kinetic energy

(B) To control the water flow and increase its potential energy.

13 Suez Governorate

Question 1

(A) 1 b 2 d 3 d 4 a

(B) Because it reacts with the oxygen of the air.

Question 2

(A) 1 ✓ 2 ✗ 3 ✗ 4 ✓

(B) Charcoal

Question 3

(A) 1 gently 2 Oil
3 renewable 4 deposition

(B) A delta will be formed.

14 Port Said Governorate

Question 1

(A) 1 d 2 a 3 d 4 a

(B) Weathering

Question 2

(A) 1 ✗ 2 ✗ 3 ✗ 4 ✓

(B) Because iron reacts with oxygen.

Question 3

(A) 1 Mars 2 renewable
3 rocks 4 increases

(B) A canyon will be formed.

15 Behira Governorate

Question 1

(A) 1 c 2 b 3 a 4 b

(B) Law of Conservation of Energy

Question 2

(A) 1 ✗ 2 ✓ 3 ✓ 4 ✓

(B) Irritation of eyes and lungs – Damage of lungs – Heart diseases

Question 3

(A) 1 c 2 a 3 d 4 b

(B) Generator

5 Giza Governorate – Exam 1

Question 1
(A) 1 c 2 a 3 b 4 a
(B) oxygen

Question 2
(A) 1 ✓ 2 ✓ 3 ✓ 4 ✗
(B) Sediments will be deposited forming a delta.

Question 3
(A) 1 water 2 biofuel
3 Sun 4 sound
(B) Acid rain

6 Giza Governorate – Exam 2

Question 1
(A) 1 ✗ 2 ✓ 3 ✓ 4 ✗
(B) the erosion and deposition of the wind-blown sand

Question 2
(A) 1 b 2 a 3 c 4 c
(B) delta

Question 3
(A) 1 c 2 a 3 d 4 b
(B) weaker and break down easily.

7 Giza Governorate – Exam 3

Question 1
1 Chemical energy
2 Global warming
3 Electrical energy
4 Sand dunes 5 Lichens

Question 2
1 ✗ 2 ✗ 3 ✓ 4 ✓
5 ✗

Question 3
(A) 1 c 2 a 3 b
(B) 1 Solar water heater
2 solar – thermal

8 Qalyubiyya Governorate

Question 1
(A) 1 d 2 b 3 b 4 b
(B) Photosynthesis

Question 2
(A) 1 ✓ 2 ✗ 3 ✗ 4 ✗
(B) Chemical weathering

Question 3
(A) 1 d 2 c 3 b 4 a
(B) Oil - Nautural gas

9 Alexandria Governorate – Exam 1

Question 1
(A) 1 b 2 d 3 d 4 a
(B) As they grow inside rock cracks, the cracks become wider, causing breaking down of rocks.

Question 2
(A) 1 thermal 2 smog
3 mechanical 4 erosion
(B) It will cause chemical weathering.

Question 3
(A) 1 ✓ 2 ✗ 3 ✗ 4 ✗
(B) Fossil fuel

10 Alexandria Governorate – Exam 2

Question 1
(A) 1 charcoal 2 Sun
3 electric lamp 4 copper
(B) ✓

Question 2
(A) 1 a 2 d 3 b 4 b
(B) Sound energy

Question 3
(A) 1 c 2 d 3 a 4 b
(B) Because it reacts with oxygen.